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CONTENTS

PAGE

ANANTHAKRISHNAN, T. N. A study on the forms of *Haplothrips* (*Trybomiella*) *apicalis* Priesner 143

BRITTON, E. B. A revision of the genus *Dermolepida* (COLEOPTERA : MELOLONTHINAE) 51

CARCASSON, R. H. The male of *Antistathmoptera daltonae* Tams (LEPIDOPTERA : SATURNIIDAE) [Communicated by J. Balfour-Browne] 24

CAWTHRA, E. M. Description of a new species of *Grypidius* Schönherr (COL.: CURCULIONIDAE) with a key to the genus 127

COE, R. L. *Didea fuscipes* Loew, a distinct species (DIPTERA : SYRPHIDAE) . . . 21

COE, R. L. Some new SYRPHIDAE (DIPTERA) from Yugoslavia 60

COLLENETTE, C. L. Some new species of LYMANTRIIDAE from Africa 155

COLLESS, D. H. Further notes on the systematics of the *Anopheles leucosphyrus* group (DIPTERA : CULICIDAE) 131

DAVIES, L. A new *Prosimulium* species from Britain, and a re-examination of *P. hirtipes* Fries from the holarctic region (DIPTERA : SIMULIIDAE) 1

DRAKE, CARL J. A new pepper Tingid from New Britain 203

GILLIES, M. T. New records and species of *Euthraulus* Barnard (Ephemeroptera) from East Africa and the Oriental region 43

HAIDER, S. R. *Sciapus oldroydi* sp. n., a new species of DOLICHOPODIDAE (DIPTERA) from Dacca (East Pakistan) 197

HARKER, JANET E. Some new Australian Ephemeroptera 63

HARKER, JANET E. Some new Australian Ephemeroptera—continued 69

HINCKS, W. D. New species of the genus *Diplatys* Serville (DERMAPTERA : PYGIDICRANIDAE) 149

HOOD, J. DOUGLAS. A new *Cercyothrips* (Thysanoptera) from Trinidad 140

HOOD, J. DOUGLAS. Two new Thysanoptera from the Belgian Congo 172

JACKSON, T. H. E. and HOWARTH, T. G. *Diestogyna butleri* Aurivillius (LEPIDOPTERA : NYMPHALIDAE) and corrections to an earlier paper 99

KLOTS, A. B. and HEINEMAN, B. The identity of *Papilio nise* Cramer, 1775 (LEPIDOPTERA : PIERIDAE) and a neotype designation for this nominal species . . . 206

LEWIS, D. J. Some sandflies (PHLEBOTOMINAE) of Malaya 165

MARSHALL, SIR GUY A. K., K.C.M.G., F.R.S. A new subfamily of CURCULIONIDAE (COLEOPTERA) 17

MOORE, B. P. The identity of *Ptinus latro* auct. (COLEOPTERA : PTINIDAE) . . 199

MUKERJI, S., RAMDAS MENON, M. G. and CHATTERJEE, S. N. The taxonomic position of *Caryedon fuscus* (Goeze), *C. gonager* (Fabricius) and *C. languidus* (Gyllenhal) (COLEOPTERA : BRUCHIDAE) based on a study of the genitalia 103

OLDROYD, H. The genus *Sisyrnodytes* Loew (DIPTERA : ASILIDAE) 79

RAGGE, D. R. A revision of the genus *Tropidonotacris* Chopard, 1954 (ORTHOPTERA : TETTIGONIIDAE) 119

RAGGE, D. R. A new species of *Phaneroptera* Serville from Formosa (ORTHOPTERA : TETTIGONIIDAE) 123

SALMON, J. T. A new species of ENTOMOBRYIDAE from India (COLLEMBOLA) . . 49

SHORT, J. R. T. On the final instar larva of *Stilbops* (*Aphanoroptrum*) *abdominale* (Grav.) (HYMENOPTERA : ICHNEUMONIDAE) 175

SMIT, F. G. A. M. Siphonaptera from the Isles of Amsterdam and Kerguelen, collected by Patrice Paulian, and from Antipodes Island 189

SMITHERS, C. N. Three new species of MYOPSOCIDAE (PSOCOPTERA) from Natal . . 11

SOUTHWOOD, T. R. E. and WOODROFFE, G. E. On the systematic position of *Cyllecoris dispar* Boheman (HEMIPTERA : MIRIDAE) 29

SPENCER, K. A. A new species of AGROMYZIDAE (DIPTERA) from Britain . . . 162

SPENCER, K. A. Notes on the British species of *Melanagromyza* Hendel (DIPTERA : AGROMYZIDAE), with the description of four new species, and also of three new species from Germany 179

PAGE

TAKAHASHI, R. Two new genera and species of APHIDIDAE from Japan (HOMOPTERA) 177
VAN SOMEREN, V. G. L. Two apparently undescribed female *Charaxes* (LEPIDOPTERA : NYMPHALIDAE) 107
WATSON, A. Taxonomic notes on the genera *Spidia* Butler and *Hemictenarcha* Warren (LEPIDOPTERA : DREPANIDAE), with a description of a new subspecies from Mt. Ruwenzori 113
WILLIAMS, D. J. The genus *Semelaspidus* MacGillivray (Aspidiotini : Coccoidea : Hemiptera) 33
WISE, K. A. J. A new species of *Lithocolletis* (LEPIDOPTERA : GRACILLARIIDAE) from New Zealand 26
WYGODZINSKY, P. Notes and descriptions of MACHILIDAE and LEPISMATIDAE (THYSANURA) 89
BOOK NOTICES 32
INDEX 217

A NEW *PROSIMULIUM* SPECIES FROM BRITAIN, AND A RE-EXAMINATION OF *P. HIRTIPES* FRIES FROM THE HOLARCTIC REGION (DIPTERA : SIMULIIDAE).

By L. Davies.

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The question of the identity of the common and sometimes obnoxious blackfly, known to various writers dealing with the fauna of different parts of the Holarctic region as *Prosimulium hirtipes* Fries, 1824, has been raised several times (Smart, 1945). Edwards (1915) ascribed Fries' name to the N. European species and his diagnosis has been accepted as correct by the majority of subsequent writers. Puri (1925) described the larva and pupa of Edwards' *hirtipes* from Scandinavian and French material. The problem, which the second section of this paper attempts to elucidate, has been to determine how far the species called *hirtipes* Fries in various parts of the Holarctic conforms structurally to the species as diagnosed and described by Edwards and Puri. In the first section of this paper a new species allied to *P. hirtipes* Fries *sensu* Edwards is described.

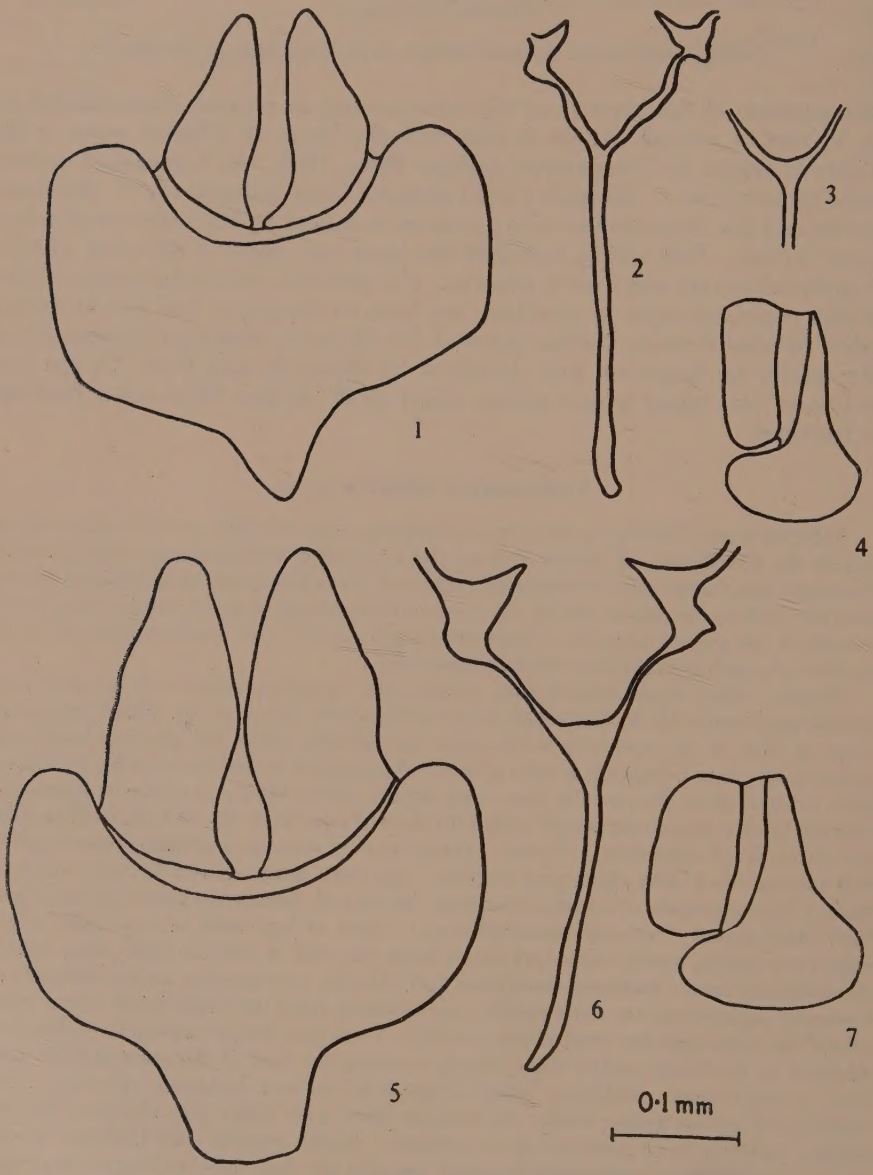
Prosimulium inflatum sp. n.

Differing from *P. hirtipes* in the larval submentum and mandible, in the female genitalia and in the distribution of yellow hair on the wing veins in both sexes; from *P. saltus* Stone and Jamnback and *P. rhizophorum* Stone and Jamnback in the form of the respiratory filaments and in the latter case in the colour of the female, from *P. travisi* Stone in the texture of the pupal thorax and pupal chaetotaxy and from *P. ursinum* Edwards in the number of pupal filaments and larval submentum.

Female.—Body length 3·5–4·5 mm.; wing length (15 specimens) 3·6–4·3, mean 4·0 mm.; general appearance black with slight greyness, legs dark. *Head* (fig. 9). Frons grey, about twice as wide at the vertex as at the point immediately above the antennal bases, with yellow hairs; eyes occupying an area of the head equivalent to that shown in fig. 9; clypeus grey, inflated when seen in side view, with mainly yellow hairs; antennae 11-segmented, entirely black; mouth-parts dark with fully formed mandibles (44–50 teeth) and maxillae (28–32 teeth) (3 specimens). *Thorax.* Integument of scutum, scutellum, post-scutellum and pleurae black with slight grey dusting; legs dark brown except for tarsi which are black; hairs and scales of scutum, scutellum, pleural tuft, femora and tibiae, golden yellow; tarsi black-haired; halteres blackish-brown; claws of legs with minute basal tooth; wing veins brown, mainly with dark brown hairs, but with in addition pale yellow hairs on the following veins: scattered along basal half of costa, very sparsely on upperside of subcosta and copiously on its under surface, and scattered along the whole length of the upperside of the radius and the basal half or so of R1. These pale yellow hairs on the veins are in addition to the longer yellow hairs densely covering the base of the costa and the basal vein (= stem vein). *Abdomen.* Basal fringe hairs yellow; abdomen with fairly dense vestiture of golden yellow hairs; all tergites black with slight grey dusting, distinctly shining particularly on posterior three segments; eighth sternite with U-shaped median anterior prolongation, gonapophyses about one and one half times as long as the length of the eighth sternite excluding its anterior prolongation (fig. 5); genital rod with the angle at the point of bifurcation infilled with sclerotisation as shown in fig. 6; anal lobe

and cercus as shown in fig. 7 ; spermatheca spherical, sometimes asymmetrically distorted, with coarsely reticulate black wall, about 140 microns diam.

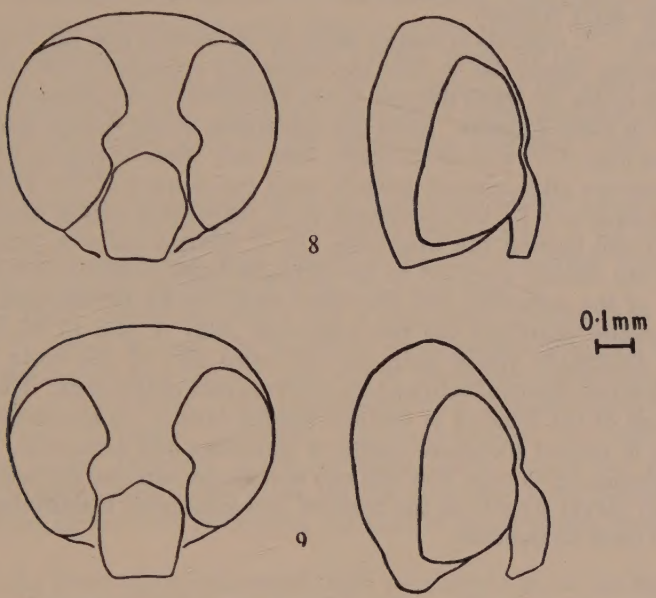
Male.—Identical with British *P. hirtipes* as far as can be detected, except for the following differences : (1) the hairs of the dorsum of the thorax and pleurae are bright golden yellow, instead of pale yellow ; (2) all parts of the genitalia are about 1·25 times larger than in *hirtipes* ; (3) yellow hairs are distributed on wing veins as described for the female. Coxites, styles and ventral plate similar to *hirtipes*, the styles bearing two teeth (8 specimens).



FIGS. 1–7.—Female genitalia. (1)–(4) *P. hirtipes*, Britain ; (3) shows a common variation involving some infilling of the genital fork junction. (5)–(7) *P. inflatum* sp. n.

Pupa.—Size, length and number of respiratory filaments, chaetotaxy and cocoon similar to *P. hirtipes* as described by Puri (1925) except for following features : the three common bases to the groups of respiratory filaments longer (fig. 19), and the filaments themselves lying well separated in their terminal portions (these differences will not separate *P. inflatum* from S. European and N. American *P. hirtipes*) ; fourth abdominal sternite normally devoid of posterior hooks, one specimen among twelve examined having a pair of posterior hooks and lateral to each a minute tubercle.

Mature larva.—Similar to *P. hirtipes* as described by Puri (1925) except in the following features : Head capsule larger and heavier. As an index of capsule size the distance between the tips of the outermost submental tooth of each side is given : (microns), 120–144, mean 131 (14 specimens). (British *hirtipes*, 99–114, mean 104 (22 specimens)) ; head capsule jet-black, sometimes dark brown with indeterminable faint dorsal pattern ; width of posterior



FIGS. 8, 9.—Female head. (8) *P. hirtipes*, Britain ; (9) *P. inflatum* sp. n.

ventral emargination of head capsule slightly but constantly less than in *P. hirtipes* (figs. 14, 16) ; outermost submental tooth strongly enlarged, as high as or slightly higher than the median trifid tooth (fig. 10) ; sub-apical ridge of mandible with 16–20 upright teeth (fig. 10) ; mandibular phragma extended ventrally (fig. 15) ; length of sclerotised portion of maxillary palp 1·8–2·2 × (mean, 2·0 ×) the width at the base (10 measured). (In British *P. hirtipes* corresponding ratio 1·3–1·6 × (mean 1·4 ×) in 10 measured.)

Young larva (2–4 mm. long).—Sub-apical mandibular ridge with upright teeth ; both outermost and innermost of the three main lateral submental teeth enlarged. (In British *hirtipes* larvae of the same size, only innermost of the main lateral submental teeth is enlarged.)

ENGLAND : Crowdundle Beck, Cross Fell, Cumberland, 8 ♂, 2 ♀ from pupae, and 50 larvae, 16.vii.1953 (*L. Davies*) ; 20 ♂ and 15 ♀ bred from pupae, 5.viii.1954 (*L. Davies*).

Holotype (♀) and paratypes (♂ and ♀, larvae and pupae) in the British Museum (Nat. Hist.). Paratype specimens of all stages are also deposited

in the Paris Museum, the Canadian National Collection and the U.S. National Museum.

In addition to the type series from Crowdundle Beck[1] numerous other specimens of all stages have been obtained (1953–55) from the same stream, from the streams Knock Ore Gill[1] and Swindale Beck,[1] Westmorland, from Whit and Salehow Becks, Skiddaw, Cumberland, and the following Scottish localities : nameless stream, Dalwhinnie, Inverness-shire, and eight streams on Braeriach and neighbouring mountains, in the counties of Inverness, Banff and Aberdeen.

In all cases *P. inflatum* breeding sites have proved to be the extreme upper reaches of rapid-flowing, permanent hill-streams, no aquatic stages having been encountered below 650 metres altitude. In 1953–55 adults emerged from mid-July to early August.

Remarks.—P. inflatum is clearly allied to *P. hirtipes* and the two species are unusual among Simuliidae in that the males are apparently virtually identical while the females are quite distinct in the structure of the genitalia and related parts, and in other respects. Since the differences in the female genitalia of the two species (figs. 1–7) can be properly seen only when the parts are examined on a microscope slide, pinned females (and males also) of the two forms can usually be separated by the occurrence in *P. inflatum* of yellow hairs on certain wing veins well beyond the wing base. In *P. hirtipes* females, yellow hairs on the wings are usually confined to the extreme basal portions of the costa and underside of the subcosta, and the basal vein. In 53 British and Norwegian *hirtipes* females examined for this character, only 5, and in 58 males none, possessed detectable yellow hairs on the basal half of the costa and radius distal to those on the basal vein and the extreme base of the costa. The differences in the heads of the females of the two species (figs. 8, 9) are more difficult to appreciate in pinned specimens owing to shrinkage and distortion.

It is interesting to note that the two species are structurally separable even in the early larval stages, on the basis of the sub-apical mandibular ridge and submental teeth characters.

A Comparison of *P. hirtipes* and Allied Forms from Various Holarctic Localities.

Although it is impossible to be certain of the species that Fries described under the name *P. hirtipes*, it seems reasonable to accept as probably correct the re-definition of the species in Europe by Edwards (1915) and Puri (1925) and followed by subsequent writers (Smart, 1945). Edwards (1927) gave reasons for applying Fries' name to the dark-legged *Prosimulium* found in N. Europe. The object of the present work has been to determine whether any structural variation occurs within the entity known as *P. hirtipes* within N. Europe, and also whether any differences occur between this form and those to which the same name has been applied in certain other parts of the Holarctic.

Detailed re-examination of British *P. hirtipes* specimens has been made to provide a basis for the comparison of the species, in terms of Edwards' and Puri's concept of it, with material from other regions. The British material included specimens from the Scottish Highlands, N. England, and N. Wales.

[1] Streams on the Moor House Nature Reserve.

Larva.—Submental teeth and sub-apical mandibular ridge (fig. 11) as described by Puri (1925); sclerotized portion of maxillary palp 1·3–1·6 ×, mean 1·4 ×, as long as its width at the base (10 measured).

Pupa.—Chaetotaxy and respiratory filaments (fig. 18) as described by Puri (1925); 16 respiratory filaments in both right and left organs in 40 specimens.

Female.—Eighth sternite with median anterior V-shaped projection and gonapophyses appreciably shorter than the length of the eighth sternite including its anterior projection (fig. 1); genital rod normally as in fig. 2, sometimes with slight infilling of the angle of the fork (fig. 3); anal lobe and cercus as in fig. 4; pubescence of dorsum of thorax, pleural tuft and fore-coxae constantly pale yellow; all antennal segments and tarsi black; femora and tibiae uniformly blackish-brown; claws usually with minute basal tooth as described by Grenier (1947) but frequently the minute tooth is absent on one or both claws of a leg; wing length 3·6–4·3, mean 4·0 mm. (15 specimens).

Male.—As described by Edwards (1915); right and left style bearing two teeth in all specimens seen. Edwards described a single specimen to have two teeth on one style and three on the other, this condition being apparently rare in British males.

Norwegian *hirtipes* specimens from the Engabreen Glacier district, Svartisen, Nordland (lat. 66° 42′ N.) have been found to agree exactly in the above larval, pupal and adult characters with British material. The wing length of Norwegian females is 3·5–4·6, mean 4·0 mm. (15 specimens).

Grenier (1947, 1953) considered the S. European *Prosimulium* previously known as *P. rufipes* Meigen, the female of which possesses yellow femora and tibiae, as not specifically distinct from the N. European dark-legged form and referred it to *hirtipes* Fries. The light-legged form as represented by material from near Lac du Gaube, Cauterets, Hautes Pyrenees, has been examined. In addition to the difference in the leg colour of the female and in the basal abdominal fringe colour of the male, the Pyrenees specimens have been found to differ from British and Norwegian material in the following constant larval features:

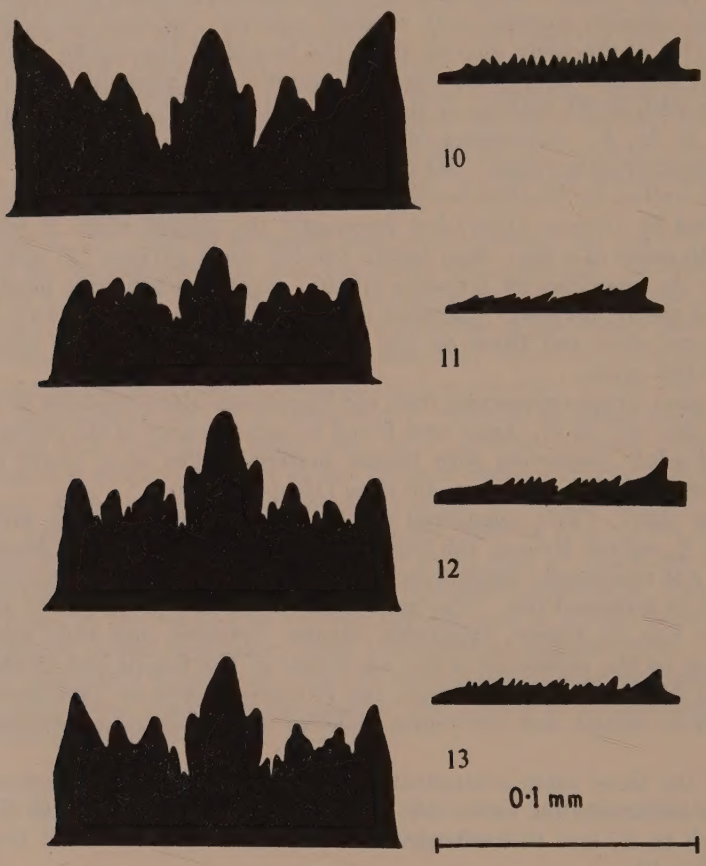
(1) Of the three main submental teeth on either side of the median trifid tooth, the outermost on either side is enlarged in comparison with the next main tooth to it, and this enlargement is often more pronounced than that shown in fig. 12.

(2) The sub-apical mandibular ridge bears higher and more distinct teeth (fig. 12) than the low serrations found in British and Norwegian larvae (fig. 11).

(3) The length of the sclerotized portion of the maxillary palp is 1·7–1·9 ×, mean 1·75 ×, the basal width (8 measured), as compared with 1·3–1·6 ×, mean 1·4 ×, in British larvae.

P. rufipes specimens from Val d'Arolla, Canton de Valais, Switzerland, show the same larval features as those of the Pyrenees specimens, but differ from them in the pupal stage in the possession of longer basal trunks in the respiratory organ, resembling those of *P. inflatum* sp. n. (fig. 19). A further indication that the S. European *Prosimulium* may not be a homogeneous entity, as the N. European *hirtipes* seems to be, is given by the following results. In two females from the type series of *P. gallii* from Switzerland, a species which Edwards erected in 1921 and later (Edwards, 1933) considered synonymous with *P. rufipes* Meigen, the median anterior projection of the eighth ster-

nite is U-shaped, while that of the Pyrenees specimens is V-shaped, as in N. European material. A single female from Obergurgl, Tirol, Austria, has markedly longer gonapophyses than is characteristic of all other European material examined, and a U-shaped eighth sternite projection.



FIGS. 10–13.—Submentum and subapical mandibular ridge of larva. (10) *P. inflatum* sp. n.; (11)–(13) *P. hirtipes*, (11) Britain; (12) Pyrenees; (13) Alaska.

Larvae of *P. hirtipes* var. *arvernense* Grenier, from Clermont-Ferrand, Massif Central, France, differ from British *hirtipes* larvae in the following aspects:

(1) The sub-apical mandibular ridge possesses distinct teeth, as in the Pyrenees *P. rufipes* specimens (fig. 12).

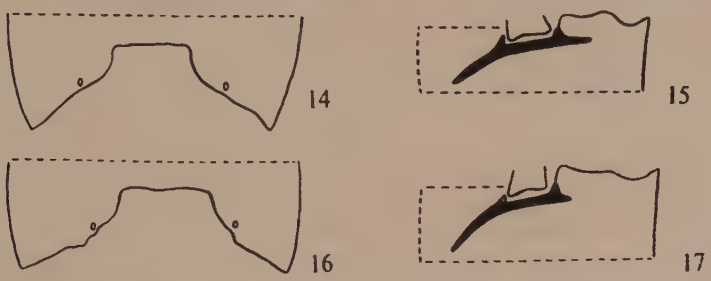
(2) The sclerotized part of the maxillary palp is noticeably longer in relation to its basal width than in British larvae. In 13 palps measured the length was 1·5–1·75 ×, mean 1·6 ×, the basal width.

The above larval differences, coupled with the increased number of pupal filaments (usually 25 in each organ), suggest that var. *arvernense* warrants specific recognition. Furthermore they differ from *P. rufipes* larvae from the

Pyrenees and Switzerland in that they show little or no enlargement of the outermost submental tooth of each side. In this feature, and in the structure of the sub-apical mandibular ridge, the Clermont-Ferrand larvae agree with the figures given for material of this form from Yugoslavia by Zivkovic and Filipovic (1956).

P. hirtipes specimens from many N. American localities show considerable structural and colour diversity, some features of which are outlined below.

Larva.—Specimens from near Anchorage, Alaska, and Whitehorse, Yukon Territories, show constant enlargement of the outermost submental tooth,



FIGS. 14–17.—Posterior ventral emargination of head capsule and mandibular phragma of larva. (14), (15) *P. inflatum* sp. n.; (16), (17) *P. hirtipes*, Britain.

FIGS. 18–19.—Bases of pupal respiratory filaments. (18) *P. hirtipes*, Britain; (19) *P. inflatum* sp. n.

and have a toothed sub-apical mandibular ridge (fig. 13). These larvae agree with the description in Sommerman (1953). In larvae from S. Ontario and S. Quebec, the submentum is variable and often shows a general similarity to that of British larvae, while specimens from Goose Bay, Labrador, show enlargement of the outer sub-mental tooth, coupled with rather low teeth on the sub-apical mandibular ridge. In all N. American larvae seen the length of the sclerotized part of the maxillary palp exceeds 1·6 × the basal width, usually approaching 2·0 ×.

Pupa.—In all specimens seen the common bases of the three main groups of respiratory filaments are long, approximately as illustrated for N.Y. State specimens by Stone and Jamnback (1955, fig. 64). The angle of divergence of the three common trunks from each other is, however, very variable, so that the whole tuft of filaments varies in shape in material from a single locality.

D. M. Davies (1949) found that *hirtipes* specimens from Ontario showed remarkable variability in the number of pupal respiratory filaments.

Female.—In specimens from near Anchorage, Alaska, the gonapophyses are short, being appreciably shorter than the length of the eighth sternite including its median anterior U-shaped projection. In all other N. American specimens seen from diverse localities the gonapophyses are considerably longer, equalling or exceeding in length the eighth sternite including its median projection. This projection is U-shaped in the majority of specimens while in the remainder it is intermediate between V- and U-shaped. The genital rod, cerci and anal lobes resemble those of British specimens. Stone and Jamnback (1955) found that N.Y. State specimens possess a small tooth near the base of the claws of the legs. Four specimens from S. Quebec lacked this feature. The colour of the legs, antennae and halteres of N. American females is appreciably lighter and more variable than in N. European specimens, as shown by direct comparison. In the descriptions of Twinn (1936), Nicholson and Mickel (1950) and Stone and Jamnback (1955), all pertaining to N. American *hirtipes* the basal two segments of the antennae are stated to be brown or at least paler in colour than the black remaining segments. Further, these authors state that the colour of the femora and tibiae of the female ranges from blackish-brown to yellowish-red, and that the haltere colour is yellowish-brown. None of these features agree exactly with those of N. European specimens, where in the long series examined, all antennal segments are black and the femora, tibiae and halteres uniformly blackish-brown. Considerable variation occurs in N. American females in the colour of the pubescence of the dorsum of the thorax, from pale whitish-yellow to deep golden-yellow. A noticeable feature is also their small average size as compared with N. European specimens. As an index of size, wing length measurements are given : Alaska, 3·2–4·4, mean 3·7 mm. (25 specimens) ; Massachusetts and N.Y. State, 2·9–4·3, mean 3·5 mm. (25 specimens). Of the 50 N. American specimens only 5 had a wing length of 4·0 mm. or more, while in 30 British and Norwegian females, 23 had wings of 4·0 mm. or more in length.

Male.—No clear-cut structural differences between the genitalia of N. American and European specimens can be detected. D. M. Davies (1949) described considerable variability in the number of style-teeth in Ontario specimens, and the figure given in Stone and Jamnback (1955) shows three teeth on both styles. The presence of this number of teeth on one or both styles appears to be common in N. American but rare in N. European specimens. The remarks concerning the small size of N. American *hirtipes* females as compared with those from N. Europe apply to the males also.

Discussion.

P. hirtipes specimens from Britain and from Norway seem to be identical and to differ in certain constant larval and adult characters from those from the Pyrenees and Swiss Alps. It is suggested that the name *P. hirtipes* Fries should be restricted to the dark-legged N. European species displaying the characters given (page 5), and that the name *P. rufipes* Meigen should for the present be retained for the light-legged *Prosimulium* found in S. Europe.

The structural features of *P. hirtipes* var. *arvernense* Grenier suggest that it is a distinct species, separate from both *P. hirtipes* and *P. rufipes* in the above

sense. This form was thought by Grenier (1947, 1949) to be restricted to the Massif Central of France. Its specific distinction has been rendered more probable since it has recently been found to occur alongside *P. rufipes* in the Pyrenees and to occur in Spain (Doby and Deblock, 1955) and in Yugoslavia (Zivkovic and Filipovic, 1956).

The cytological work of Rothfels (1956) has disclosed the existence of at least two sibling-species with well marked differences in their salivary gland chromosomes in *hirtipes* material from S. Ontario. It seems that what has previously been regarded as a single species in N. America is in reality a species-complex, with little structural differentiation between its members. The apparent variability of N. American *hirtipes* material, described in the present paper, may prove to be correlated with genetically distinct forms. Only further morphological examination of material of known cytological characteristics can determine whether this is so. None of the numerous N. American *hirtipes* specimens agree at all closely with the N. European material, nor do they agree with *P. inflatum* sp. n. This suggests that the dark-legged N. European form to which the name *P. hirtipes* Fries has been given by Edwards (1915) and Puri (1925) has not so far been shown to occur in N. America, and that the members of the species-complex hitherto given this name in that region are probably all specifically distinct from it. This suggestion is given some confirmation from the results of Rothfels (1956*a*), who has found that the salivary gland chromosomes of British *hirtipes* larvae submitted to him by the writer differ in various important respects from those of all the S. Ontario forms that he has studied.

ACKNOWLEDGMENTS.

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SUMMARY.

1. *Prosimulium inflatum* sp. n. is described from Britain.

2. A comparison of the structure of specimens ascribed to *P. hirtipes* Fries from various parts of the Holarctic region reveals differences which suggest that this name should be restricted to the form found in N. Europe, the structural and colour characteristics of which are re-described. It is suggested that the name *P. rufipes* Meigen should be retained for the form found in S. Europe, and that *P. hirtipes* var. *arvernense* Grenier is probably a distinct species. Of the several N. American forms called *P. hirtipes* that were examined none agree with the features of the N. European species given that name.

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THREE NEW SPECIES OF MYOPSOCIDAE (PSOCOPTERA) FROM NATAL.

By C. N. Smithers.

(*P.O. Box* 8100, *Causeway, Southern Rhodesia.*)

During 1954 and 1955 particular attention was paid to collecting Psocoptera in Natal, South Africa. A large number of species was taken, mainly in the vicinity of Pietermaritzburg; some were taken in other localities. The present paper deals with the three species of Myopsocidae in this collection; all three are new.

All the material is retained in the author's collection.

Rhaptoneura magnifica sp. n.

Female.—*Coloration* (in alcohol): Vertex, frons, genae and postclypeus (except for anterior border) yellowish-brown, lightly speckled with small, well-separated dark brown spots; spots on the postclypeus tending to lie in lines corresponding to the facial stripes common in the order; epicranial suture dark brown; anteclypeus dark brown, especially laterally; foramen magnum surrounded by a narrow band of dark brown. Eyes black. Ocelli pale, bordered internally with dark brown. Antennae with first two segments pale, marked with dark brown on anterior surface; first three flagellar segments mostly pale brown, dark brown distally, the proportion of dark to light brown increasing with each segment until, in the fourth and subsequent segments, the whole segment is dark. Labrum dark brown. Maxillary palps brown, with fourth segment darker still.

Prothorax dark brown dorsally, mottled light and dark brown laterally. Mesothorax with median lobe pale yellowish-brown, speckled as head; lateral lobes similar but with a postero-medial brown patch; pleura mottled light and dark brown.

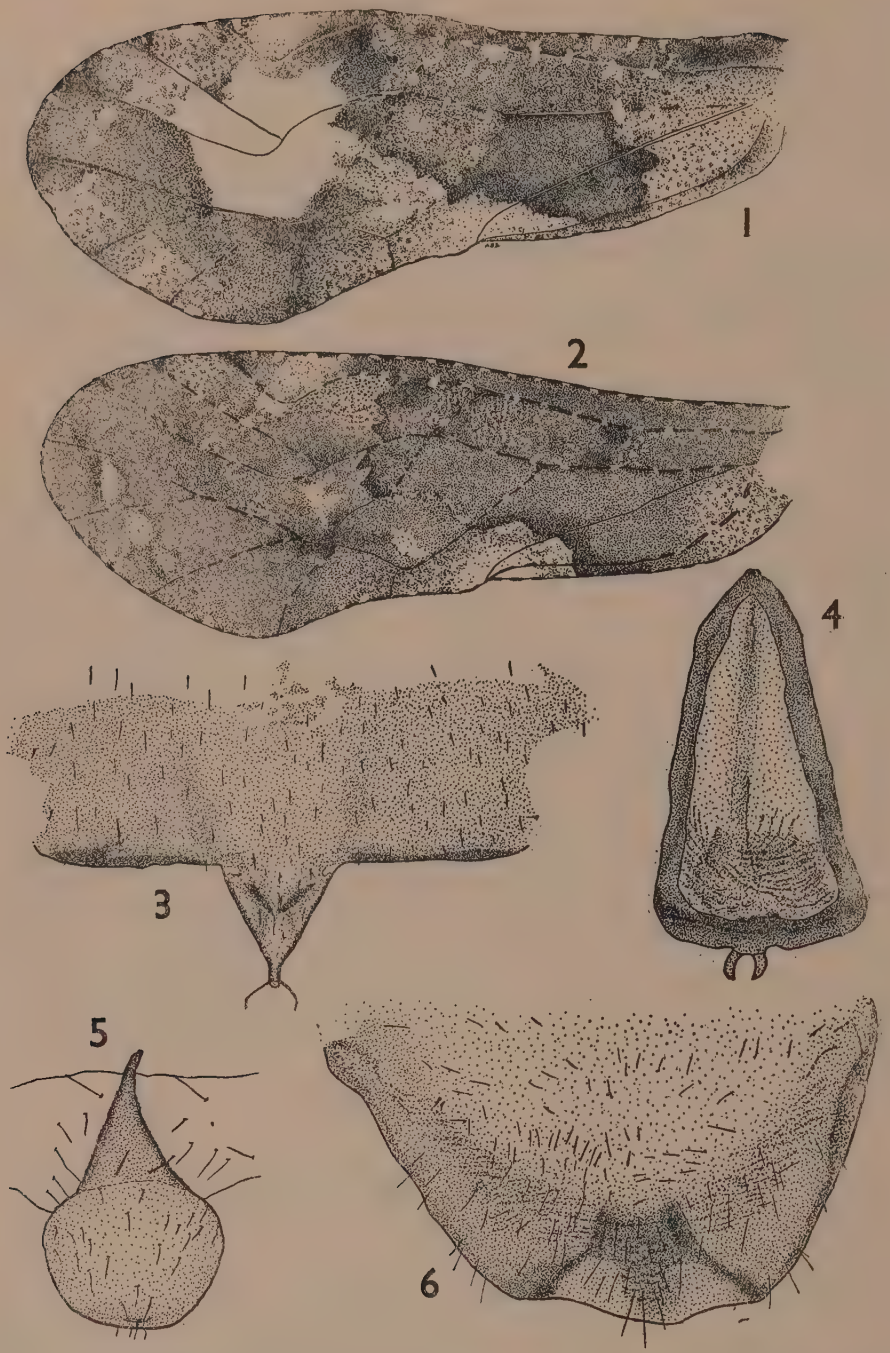
Legs of pro- and mesothorax with femora dark brown with a lighter area occupying approximately the middle third; within this area lies a well-defined irregular dark patch; tibiae basally dark brown becoming lighter with apical part dark brown; first tarsal segment light brown with dark brown extremity; second and third segments wholly dark. Metathoracic legs similar to first two pairs except for the femora, the middle pale area being merely suggested and not well defined. Claws dark basally, paler distally.

Fore wings (fig. 1) beautifully mottled in a great variety of shades from light brown to almost black; a large hyaline area occurs in the distal third of the wing. Veins marked in alternating light and dark lengths as usual in the genus, except in the hyaline area and for Cu_2; these are pale. Hind wings hyaline, faintly tinged with brown, slightly darker in costal area; margins spotted between R_1 and R_{4+5}. Veins brown.

Abdomen brown; terminal structures dark brown.

Morphology: Length of body (in alcohol) 5·5 mm. Head and body finely pubescent. Antennae strongly setose. Relative lengths of antennal segments: 1·2 : 1·0 : 10·4 : 7·0 : 6·8 : 6·4 : 5·0 : 3·4 : 2·2 : 2·0 : 1·6 : 1·4 : 1·8. 10 : D (Badonnel) = 2·0 : 1. 10 : D (Pearman) = 2·2 : 1. Relative lengths of hind tarsal segments: 8·0 : 1·0 : 1·4; first segment with 20 ctenidiobothria. Claws with strong pre-apical tooth.

Length of fore wing 4·5 mm. Width of fore wing 1·8 mm. In the fore wing *Rs* and *M* fused for a very short length; apex of areola postica meets *M* in a point; wings without setae. Length of hind wing 3·3 mm. Width of hind wing 1·3 mm. In hind wing *Rs* fused with *M* for a distance, after which *M* curves to continue more or less parallel with anterior margin of wing; Cu_1 sharply recurved near hind margin; first anal vein nearly straight; wings without setae.



FIGS. 1–6.—(1) Fore wing of *Rhaptoneura magnifica* sp. n. (2) Fore wing of *R. crypta* sp. n. (3) Subgenital plate of *R. magnifica*. (4) Penial complex of *R. crypta*. (5) The same, epiproct of male. (6) The same, hypandrium.

Epiproct setose, with sclerotised apical margin; paraproct triangular, setose, carrying a field of 30–35 trichobothria. Subgenital plate (fig. 3) with a straight hind border from which projects a median triangular lobe; the apex of the lobe carries two strong, outwardly-curved setae; body of plate setose. Gonapophyses with ventral valve somewhat reduced, curved and pointed; dorsal valve basally stout with a long tapering sharply pointed extremity; external valve roughly rectangular, setose.

Paratype female.—This specimen agrees well with the above description of the holotype.

MALE.—Unknown.

Rhaptoneura magnifica can be distinguished from other members of the genus by the pattern of the fore wing. The subgenital plate is distinctive, although somewhat similar to that of the European *R. eatoni* (MacL.) in shape and in having two outwardly bent apical setae. This plate in *R. africana* Badonnel, from Angola, has four terminal setae.

Material examined.—Holotype ♀ (dissected, Slide 70–1), SOUTH AFRICA: Inchanga, Natal, 11.iv.55 (*C. N. Smithers*). Paratype ♀ ((in alcohol), Tube No. 218), St. Helier, Natal, 31.v.55. (*A. S. Smithers*).

Rhaptoneura crypta sp. n.

MALE.—*Coloration* (in alcohol): Head generally pale brown; epicranial suture dark brown; vertex with median third on either side of epicranial suture brown, otherwise sparsely spotted with brown; frons similarly spotted; postclypeus spotted as vertex, except for an anterior band which is unspotted; anteclypeus pale and unmarked. Labrum more or less uniform brown; genae brown with a paler stripe running from antenna base to below eye, darker near base of mandible. Antenna with scape and pedicel dark brown on outer side, paler on inner; flagellar segments brown, darkening distally, the darker region of greater extent on second than on first flagellar segment (the antennae of the holotype are incomplete, those of the paratype have the flagellar segments from the third onwards dark brown). Eyes black. Ocelli very pale, bordered internally with very dark brown. Maxillary palps brown.

Prothorax dorsally pale, laterally darker brown; lobes of mesothorax brown, paler on either side of the sutures; lateral lobes posterolaterally pale brown, with dark spots; pleura dark brown; metathorax dorsally brown, darker medially; pleura dark brown.

Legs with coxae brown; femora brown, darker distally, with an external pale area from one-third to three-quarters of the length from the trochanter; within this pale area is an irregular dark brown patch; tibiae brown, almost black at tip; first tarsal segment almost black proximally, otherwise pale brown; distal segments of tarsus dark brown.

Fore wing (fig. 2) with membrane mottled in various shades of brown as usual in the genus; the most conspicuous feature of the mottling is a series of irregular, separated, paler areas running parallel with the wing margin from the distal end of pterostigma through the marginal cells to cell M_3; veins and margin of wing marked with alternating light and dark lengths, except Cu_1, which is pale. Hind wing hyaline, faintly tinged with brown, wing margin with alternating dark and light lengths between R_1 and R_{4+5}.

Abdomen very pale, mottled with brown areas on ventral surface; terminal segments brown.

Morphology: Length of body (in alcohol) 3·4 mm. Head with distinct median epicranial suture; vertex gently rounded, almost flat-topped, clothed with fine hairs, as is the frons; postclypeus hardly bulging, a little more densely hairy than vertex; anteclypeus and genae without hairs. Antennae strongly setose. Relative lengths of antennal segments:— 1·1 : 1·0 : 7·9 : 5·0 . . . (antennae incomplete). Eyes large and prominent; 10 : D (Badonnel) = 1·25 : 1, 10 : D (Pearman) = 1·25 : 1. Ocelli prominent. Mandibles with preapical tooth on incisor edge.

Mesothorax dorsally clothed with fine hairs ; metathorax without. Relative lengths of hind tarsal segments : 8·5 : 1·0 : 1·4 ; first segment with 23 ctenidiobothria.

Length of fore wing 4·3 mm. Width of fore wing 1·7 mm. In fore wings *Rs* and *M* fused for a short distance ; the areola postica meets *M* in a point ; wings without setae. Length of hind wing 3·5 mm. Width of hind wing 1·2 mm. In hind wing *M* curves gently posteriorly after its initial sharp curve away from junction with *Rs* ; Cu_1 slightly recurved before meeting hind margin of wing ; hind wing without setae.

Abdomen pyriform ; a double row of setae runs across the dorsum of each segment.

Epiproct (fig. 5) almost circular ; a pointed flap arises on its anterior edge and projects cephalad over the ninth tergite ; paraproct apically spurred and ventrally setose ; hypandrium (fig. 6) simple with a shallow, broad median lobe ; this lobe, lightly sclerotised, carries strong setae medially ; penial complex (fig. 4) elongate-triangular, posteriorly armed with two short, stout, pointed, inwardly curving projections ; membranes lightly sclerotised in the median line throughout the length of the complex, and generally in the distal quarter.

Paratype male.—The paratype male specimen resembles the holotype except in depth of colour ; it is paler and probably later-matured than the holotype.

Female.—Unknown.

Rhaptoneura crypta is easily distinguished from other members of the genus by the shape of the penial complex and the epiproct.

Material examined.—Holotype ♂ (dissected, Slide 289–1), and paratype ♂ (in alcohol), Tube No. 289). South Africa : near Pietermaritzberg, Natal, beaten from lichen-covered tree, Cascade Falls, 16.xii.55. (*C. N. Smithers*)

Lichenomima maxima sp. n.

Male.—*Coloration* (in alcohol) : Head light brown patterned with darker spots ; vertex generally so spotted, two rows of spots running on each side of epicranial suture to ocellar triangle ; frons irregularly mottled ; postclypeus with anteriorly convergent rows of more or less confluent spots ; anteclypeus and labrum dark brown ; genae pale brown anteriorly, dark brown posteriorly. Antennae (incomplete) with first two segments dark brown, flagellar segments pale, each segment darkened distally. Eyes black. Ocelli pale, shaded black, adjacent to one another. Maxillary palps brown, apical segment darkest.

Prothorax dark brown dorsally ; mesothorax brown, lobes tipped dark brown anteriorly; pleura brown with darker mottlings ; metathorax dark brown dorsally, pleura paler.

First and second pairs of legs brown with three dark brown bands on femora, the first of which is basal, the second about two-thirds of the way along femur and the third at the tibial joint ; tibiae brown with dark terminal band ; first tarsal segment brown with dark tip, second and third segments dark brown ; third pair of legs as first two pairs except for the banding of the femur, which is less distinct owing to the greater extent of the dark brown areas.

Fore wings (fig. 7) mottled in various shades of brown in the manner characteristic of the genus ; a grey patch occurs in the areola postica along Cu_{1b} and in the adjacent part of cell *M*.

Hind wings hyaline, faintly tinged with brown ; veins brown ; margin marked in alternating dark and light brown lengths ; these marks are particularly pronounced along the anterior margin.

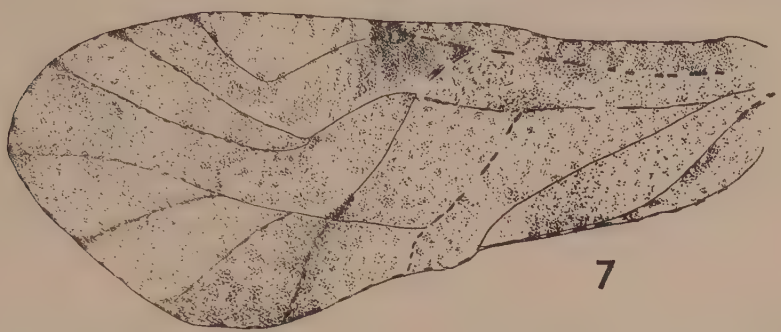
Abdomen pale ; terminal structures dark brown.

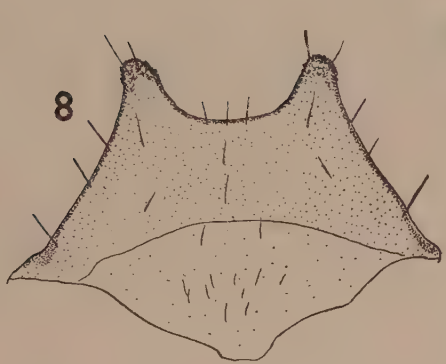
Morphology : Length of body (in alcohol) 3·0 mm. Epicranium, frons and postclypeus hairy. Antennae strongly setose. Relative lengths of antennal segments : 1·4 : 1·0 : 8·4 : 8·4 : 7·4 : 5·4 : 3·4 : 2·4 . . . (antennae incomplete). Eyes large.

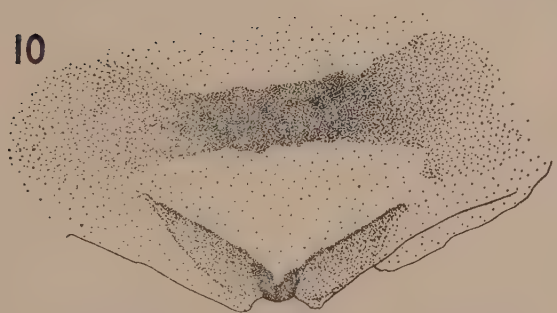
Relative lengths of hind tarsal segments : 8·0 : 1·0 : 1·3 ; first segment with 23 ctenidiobothria, second and third segments with 1.

Length of fore wing 4·4 mm. Width of fore wing 1·9 mm. In fore wing *Rs* and *M* meet in a point; apex of areola postica meets *M* in a point. Length of hind wing 3·3 mm. Width of hind wing 1·3 mm.

Epiproct (fig. 8) simple posteriorly, two-lobed anteriorly; paraproct with blunt dorsal lobe and sclerotised terminal, blunt, curved protuberance; a dorsal sclerotised lobe folds ventrad across the face of the protuberance; hypandrium simple; penial complex







Figs. 7–11.—*Lichenomima maxima* sp. n. (7) Fore wing. (8) Epiproct of male. (9) Penial complex. (10) Subgenital plate. (11) Sclerites of ninth sternite, female.

(fig. 9) elongate, tapering, with a strongly sclerotised rim and two internal lightly sclerotised areas.

Female.—*Coloration* (in alcohol): Similar to that of holotype except for the third pair of legs, which are slightly paler.

Morphology: Pilosity of antennae shorter than in male. Relative lengths of antennal segments: 1·1 : 1·0 : 9·0 : 9·6 : 8·9 : 7·0 : 3·3 : 2·5 . . . (antennae incomplete).

Relative lengths of hind tarsal segments: 9·5 : 1·0 : 1·9; first segment with 24 ctenidiobothria, second and third segments with 1.

Length of fore wing 5·3 mm. Width of fore wing 2·2 mm. Venation as in holotype but *Rs* and *M* joined by a very short cross vein. Length of hind wing 3·9 mm. Width of hind wing 1·6 mm.

Epiproct simple, triangular with apex rounded, setose, with two particularly prominent setae on each side of the apex; apex carries a group of finer setae; paraproct simple, triangular, ventral edge with a row of strong setae; a row of setae runs from the apex to the middle of the base; subgenital plate (fig. 10) with small median terminal lobe flanked by a pair of small pointed lobes; gonapophyses with ventral valves sinuous, narrow and sharply pointed; dorsal valves broad based, long and acuminate; external valves roughly reniform, setose; ninth sternite (fig. 11) with three sclerifications.

The present species is most closely related to *L. pauliani* Badonnel. The penial complex, leg annulations, epiproct and paraproct of the male, and the subgenital plate of the female, all bear resemblance to the corresponding structures of *L. pauliani*. The subgenital plate of *L. maxima*, however, has reduced flanking lobes and a more pronounced median lobe than *L. pauliani*, but lacks the strong median bristle; the sclerites of the ninth sternite are distinctive. From *L. intermedia* (Enderlein) and *L. cameruna* Badonnel the present species differs in the leg annulations as well as in the structures already discussed.

Material examined.—Holotype ♂ (dissected, Slide 88–1). South Africa: beaten from willow tree on Umlazi River, next to main Pietermaritzburg-Richmond road, Natal, 24.iv.55 (*A. S. Smithers*). Allotype ♀ (dissected, Slide 107–1), Josephine Bridge, Umkomaas River, Natal, 24.iv.55 (*A. S. Smithers*). Paratype ♀ ((in alcohol), Tube No. 121), locality as for allotype, 7.v.55 (*C. N. Smithers*).

Summary.

The present paper describes three species of hitherto unknown Myopsocidae (Psocoptera) from Natal, South Africa. Two species are placed in the genus *Rhaptoneura* Enderlein and one in the genus *Lichenomima* Enderlein.

Acknowledgments.

I am grateful to Mr. J. A. Whellan, Chief Entomologist, Department of Research and Specialist Services, Southern Rhodesia, for making available facilities for work on the Psocoptera; and to my wife for assistance with the illustrations.

A NEW SUBFAMILY OF CURCULIONIDAE (COLEOPTERA).

By Sir Guy A. K. Marshall, F.R.S.

The Commonwealth Institute of Entomology has recently received from the Agricultural Department of Stellenbosch University, South Africa, a series of a curious small weevil that has been found attacking grape vines. The general appearance of the insect did not at first suggest a Curculionid; it looked as though it might be an aberrant Anthribid, but an earlier specimen had been submitted years ago to Dr. Karl Jordan, who refused to accept it as a member of that family. Dr. E. C. Zimmerman and Mr. J. Balfour-Browne agreed that it could only be regarded as an aberrant Curculionid, and the point was settled by Dr. F. van Emden, who kindly made a preparation of the mouth parts.

The following new genus is therefore proposed for its reception.

Cryptopharynx gen. n.

General form subglobose or very broadly ovate. Head globular, almost completely embedded in a deep excavation of the prosternum, so that when it is fully withdrawn only the vertex is narrowly visible from above; eyes dorsal, quite round, very nearly flat. *Rostrum* not differentiated from the head, very short and broad, muzzle-like, phanerognathous, narrowing from base to apex, the latter when entirely withdrawn resting on the anterior face of the front coxae; the apical margin broadly truncate, without any trace of an epistome; scrobes entirely dorsal, deep, narrow and bare, running transversely at right angles to the main axis of the rostrum, so that together they form a line straight across the dorsum interrupted in the middle by the interantennal space, the points of origin of the antennae being rather close together, each lying under a very small low tubercle; mandibles comparatively narrow, rapidly tapering to a point, decussate, with some stiff suberect setae arising from a strongly punctate area near the base; mentum small, bare, resting on a peduncle, the four palpi lying closely side by side, their apices all at the same level. *Antennae* with a short curved clavate scape, bearing a few stiff suberect setae; funicle much longer than the scape, slender, 7-segmented, segment 1 as long as 2 + 3, 5–7 subglobular or transverse; the club fusiform, acuminate, 4-segmented. *Prothorax*, as viewed from above, almost semicircular, the base truncate without any marginal carina, the anterior margin broadly arcuate dorsally and very obliquely truncate laterally without post-ocular lobes. *Scutellum* concealed. *Elytra* subglobose, very convex in both directions, not wider at the base than the prothorax, jointly rounded at the apex, the base truncate but not marginate, the lateral margin not excised near the base, with ten striae, the tenth more or less obliterated, or with the striae completely eliminated by punctures. *Legs* with the front coxae very narrowly separated, or else separated nearly by the width of a coxa, the middle pair narrowly separated, and the hind pair separated by half the width of the hind coxae, which reach the margin of the elytra; the femora subcylindrical, without a tooth, the hind pair not quite reaching the apex of the elytra; the tibiae straight, gradually widening from base to apex, with only a very short mucro (but a much larger one on the hind tibiae of the male), the corbels of the hind pair open and truncate at right angles to the longitudinal axis; tarsi short and broad, squamose above and spongy beneath, segment 3 deeply bilobate, wider or not wider than 2, 4 clavate with small divaricate claws. *Sternum* with the front coxae extending from the posterior to the anterior margin of the very short prosternum; mesosternum deeply depressed, almost vertical, the mesepimera rather broadly separating the mesepisterna from the base of the elytra, the intercoxal process subtuberculate; metasternum extremely short between the coxae, being there shorter than the width of a tarsus, the metepisternal suture completely fused, and no metasternal

fold above the hind coxae. *Venter* with the intercoxal process ogival, ventrite 1 as long in the middle as 2–4 in the female, but much longer in the male, the intermediate ventrites being much constricted in the latter.

Type species: *Cryptopharynx vitis* sp. n.

The immersion of the whole head and muzzle-like rostrum into the anterior part of the prothorax distinguishes this remarkable genus from all known Curculionidae, except the aberrant North American *Thecesternus*. But in the latter genus the rostrum does not rest on the front coxae, but is separated from them by a large triangular vertical plate which is fused on each side with the anterior margin of the prothorax; moreover the antennae are widely separated, the scrobes being almost lateral in position; the narrow elongate eyes are also quite lateral, and the mandibles are very broad and pincer-like. Many other characters indicate that the two genera are in no way related; to mention a few distinctions: *Thecesternus* is a terrestrial genus with long narrow tarsi clothed with setae beneath and having segment 3 not bilobate, the onychium being about as long as the rest together; there is a strong metasternal fold over the hind coxae, which are almost round and widely separated from the elytra; the mesepisterna are not separated from the elytra by the mesepimera, and the lateral margin of the elytra is very deeply excised for the reception of the base of the metepisternum, etc.

As these aberrant insects cannot be associated with any other known subfamily of Curculionidae, it becomes necessary to erect for their reception a new subfamily, **Cryptopharynginae subfam. n.**

Cryptopharynx vitis sp. n. (Figs. 1, 2).

♂♀.—Derm black, densely squamose, the ground-colour varying from grey to brown; pronotum with a narrow indefinite median whitish stripe, which is usually somewhat indistinct in the middle, and on each side a broader sublateral whitish stripe that is more or ess constricted in the middle; elytra very variable in colour, ranging from almost uniform grey or greyish-brown to brown with a broad indefinite grey or whitish sublateral stripe between striae 3 and 6, and often at the top of the declivity a conspicuous whitish spot on interval 2 (or between striae 1 and 3) on each elytron; these spots sometimes coalescing to form a transverse band.

General form almost globular in the male and very broadly ovate in the female. *Head* with the frons nearly flat transversely, its width varying greatly, the eyes being widely separated, the space between them nearly twice the eye-width, 11 : 6 in the largest specimens and only 7 : 6 in the smallest, the hind margin of the eyes touching the front margin of the prothorax. *Rostrum* very short, narrowing from base to apex, almost flat longitudinally down the middle, moderately convex transversely, the area in front of the scrobes about five times as broad as long, the whole rather closely squamose. *Prothorax* almost semicircular, widest at the base which is nearly twice the length, not constricted at the apex, the sides making a continuous curve with those of the elytra in the female, but forming a slight re-entrant angle at the base in the male; the dorsum moderately convex longitudinally, highest at the base, very strongly convex transversely, the surface quite smooth, the very dense fine punctures being completely covered by the scales. *Elytra* with the very shallow striae almost concealed by the dense short ovate scales which are not overlapping and not quite contiguous; but some of the numerous separated punctures in the striae can be seen through the scaling, and the position of all of them is indicated by a recumbent scale-like seta, some of which are white and some brown; the broad smooth flat intervals with sparse fine punctures, without setae. *Legs* red-brown, with fairly dense subtriangular

grey scales; the external apical angle of the hind tibiae slightly produced in the female; the tarsi with segment 2 very transverse and 3 not wider than 2. *Venter* of the male with a large raised rounded concave area in the middle of ventrite 1, which causes ventrite 2 to be steeply declivous.

Length: 2·0–3·5 mm.

FIGS. 1–2.—*Cryptopharynx vitis* sp. n. (1) Male and female. (2) Female underside.

CAPE PROVINCE: Stellenbosch, 24 ♂, 24 ♀, feeding on leaves of grape vines, 1956 (type); Ceres. 1500 ft., 1 ♀, xii.1920 (*R. E. Turner*); Cape Town, 1 ♀, xii.1900 (C. W. Mally).

Also found feeding on the vine leaves at Stellenbosch were numerous small wingless Hylobiine weevils, *Cotasteridus capensis* Pér., which Péringuey wrongly placed in the Tanyrhynchinae; the species does not seem to have been recorded since Péringuey found it in numbers in 1892.

Cryptopharynx estriatus sp. n. (Fig. 3).

A single female of a closely allied species has been in my collection for about 25 years; it differs from *C. vitis* in the following particulars:—

♀.—*Head* with the eyes larger and a little more convex, the space between them being about as wide as an eye. *Prothorax* rounded laterally and narrowing at the base, so that the

FIG. 3.—*Cryptopharynx estriatus* sp. n. Female.

greatest width is at two-fifths from the base ; the anterior margin rather less arcuate, so that a little more of the head is visible from above. *Elytra* much shorter proportionately, so that the whole shape is more like that of *vitis* male, though less rotund ; the dorsum with uniform dense small punctures which entirely obliterate all trace of the striae ; the scales are twice or thrice as long and somewhat overlapping, and there is no trace of the rows of scale-like setae. *Legs* with the tibiae a little less widened apically, and the external apical angle of the hind tibiae not produced in the female ; the tarsi with segment 2 as long as or rather longer than broad and 3 distinctly wider than 2.

Length : 2·5 mm.

Cape Province : Nieuwoudtville, 1 ♀, xi.1931 (*Miss A. Mackie*).

DIDEA FUSCIPES LOEW A DISTINCT SPECIES (DIPTERA : SYRPHIDAE).

By R. L. Coe.

(*British Museum* (*Natural History*).)

In 1863 Hermann Loew described from Philadelphia both sexes of *Didea fuscipes*. Subsequently, this species has been regarded as a variety of the European *Didea fasciata* Macquart, which it rather closely resembles in external characters. It appears that Aldrich was the first author definitely to sink *fuscipes* under *fasciata* when he so listed it in his *Catalogue of North American Diptera* (1905) with the brief statement, " Osten Sacken Cat. 245, note 212, makes *fuscipes* a var. (of *fasciata*) ". In actual fact, however, it is extremely doubtful whether Osten Sacken, in the note referred to by Aldrich, intended to sink *fuscipes*. His note (1878 : 245) reads, " *Didea fuscipes*. Differs from the European *D. fasciata* in the color of the legs only (Lw. Cent. IV. 82) ". Furthermore in the *Catalogue of the Described Diptera of North America* (in which Osten Sacken's above-quoted note appears) *D. fuscipes* Loew is listed as a valid species (1878 : 124).

The fact remains that at least from 1905 *fuscipes* has been treated as a variety of *fasciata*. A critical examination of the material of *D. fuscipes* in the British Museum (Natural History) has satisfied the present writer that the species is absolutely distinct from *D. fasciata*.

In order to be certain that the material examined at the British Museum truly represents the North American *fuscipes*, the examples of both sexes of that species and of the European *fasciata* were forwarded to Dr. P. J. Darlington, Jnr., of Cambridge, Massachusetts, for comparison with the actual types of *fuscipes* in the Museum of Comparative Zoology there, the points of difference between the two species being indicated. In due course Dr. Darlington confirmed that the British Museum material of *fuscipes* agrees with the American type material.

None of the European species of *Didea* are known, therefore, to occur in North America.

D. fuscipes and *D. fasciata* differ as follows :—

D. fuscipes Loew.

♂♀.—Stigma light brown. *R*4 + 5 moderately and evenly looped, loop not pouch-like, at its lowest point normally only one-and-a-quarter to two times more removed from vein above (*R*2 + 3) than from vein below (*M*1 + 2).

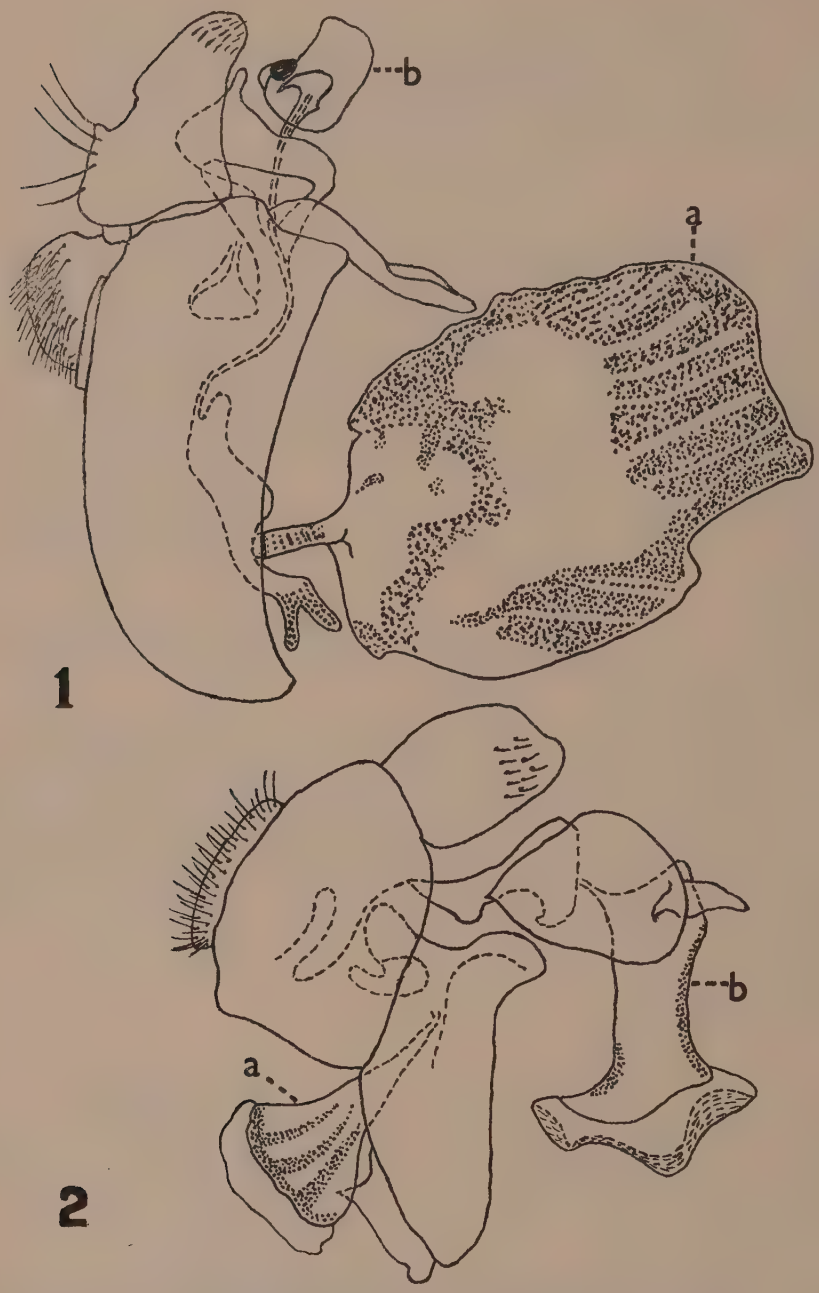
♂.—Tergite 3 with the orange or yellow stripe rather shallowly excavated behind on median line, that of tergite 4 only moderately emarginate behind; tergites 3 and 4 with the orange or yellow stripes not encroaching on the raised

D. fasciata Macquart.

♂♀.—Stigma dark brown. *R*4 + 5 deeply and irregularly looped, loop pouch-like, at its lowest point normally two-and-a-half to three times more removed from vein above (*R*2 + 3) than from vein below (*M*1 + 2).

♂.—Tergites 3 and 4 with the orange or yellow stripes deeply excavated behind on median line, with tendency to encroach upon the raised beading at actual side-margins.

Genitalia : See *fuscipes* ♂.



FIGS. 1–2.—Male genitalia of *Didea*. (1) *fuscipes*. (2) *fasciata*. (*a*, ejaculatory apodeme ; *b*, ejaculatory hood.)

beading at actual side-margins, so that there is an uninterrupted broad black border to these tergites.

The genitalia contrast with those of *fasciata*. As mentioned (but not figured) by Metcalf (1921 : 198), the development of the ejaculatory apodeme is probably the most remarkable yet noted in the Syrphidae. Whereas in *fasciata* this apparatus (fig. 2*a*) is small and the ejaculatory hood (fig. 2*b*) extraordinarily large, in *fuscipes* the ejaculatory apodeme (fig. 1*a*) assumes fantastic proportions and the ejaculatory hood (fig. 1*b*) is small. The vast difference in the size of these respective parts in the two species has resulted in a corresponding shifting of other parts of the genital structure.

♀.—Frons with the yellowish-grey dust-spots scarcely widening to spread inwards on upper part; the undusted prong of exposed blackish ground-colour (extending down to antennae) long and narrow, the enclosed triangle of yellow colouring elongate, its apex long and narrow. Tergites 3 and 4 with the orange or yellow stripes not encroaching on the raised beading at actual side-margins, so that there is an uninterrupted broad black border to these tergites. Hind femora and tibiae extensively pale.

♀.—Frons with the yellowish-grey dust-spots considerably widening to spread inwards on upper part; the undusted prong of exposed blackish ground-colour (extending down almost to antennae) short and broad, the enclosed triangle of yellow colouring almost equilateral, its apex short and broad. Tergites 3 and 4 with the orange or yellow stripes encroaching on and often occupying the raised beading at actual side-margins, so that the black border is more or less interrupted. Hind femora and tibiae usually extensively darkened.

My thanks are extended to Mr. W. H. T. Tams, of this Museum, for producing the excellent photographs from which drawings of the genitalia were made.

References.

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Osten Sacken, C. R., 1878, *Catalogue of the Described Diptera of North America*. 2nd ed. : 124 and 245.

THE MALE OF *ANTISTATHMOPTERA DALTONAE* TAMS (LEPIDOPTERA : SATURNIIDAE).

By R. H. Carcasson.

(*The Coryndon Museum, Nairobi.*)

[Communicated by J. Balfour-Browne.]

The unique female of this remarkable moth was described by Mr. W. H. T. Tams in 1935 (1935, *Stylops* 4 : 97–99). No further specimens were recorded until April 1955, when a male was taken by Mr. C. R. Howard of Kitale, Kenya Colony.

I am much indebted to Mr. Howard for the loan of the specimen, which is described and figured below.

Antistathmoptera daltonae Tams.

Male.—Antennae as in female, but pectinations about twice as long. Palpi as in female. Frons and vertex fuscous, edged with ochreous-pink laterally. Patagia bright ochreous-pink, tegulae ochreous-pink with well defined fuscous anterior edges, paler fuscous posterior and lateral edges. Thorax dorsally fuscous with an ochreous-pink transverse band followed by a fuscous one below tegulae. Abdomen as in the female but pinker.

Fore wing : Deep ochreous-pink, irregularly speckled all over with fuscous, lighter and brighter at the base, in the cell and inside the distal half of costa ; paler and duller beyond postmedial band ; proximal half of costa broadly fuscous, remainder ochreous-pink ; antemedial band as in female, fuscous with narrow, whitish proximal edge ; hyaline ocellus oval, 3 mm. at widest diameter, contiguous with outer margin of cell, proximally produced into a very small lobe which crosses into upper portion of cell ; hyaline portion of ocellus surrounded by a very narrow bright yellow ring, then a very narrow blackish fuscous ring and finally by a ring of pinkish-white about 1 mm. wide and edged distally with blackish fuscous ; the outer ring is produced near the bottom into a very small lobe which crosses into the cell ; fuscous medial shade less distinct and less bowed than in female, most clearly defined near costa and near inner margin ; postmedial band dark fuscous distally, edged with pinkish-white, running from the falcate apex to the inner margin at two-thirds as in female but not curved at the apex ; a small pale ochreous area inside the postmedial band at the apex, which is limited by the costa and by an irregular fuscous line 9 mm. long which runs from a point 1 mm. from the costa to the postmedial band ; narrow, indistinct fuscous shading distal and parallel to postmedial band from *R*5 to *M*3, widening at *M*3 into a triangle with its apex at the tornus ; fringe fuscous, paler at the veins ; inner margin straight.

Hind wing : Deep ochreous-pink, brighter inside antemedial band, speckled with fuscous beyond ; antemedial band less distinct than in fore wing ; hyaline ocellus as in female, but slightly smaller and completely divided into a larger distal circle and a smaller proximal one, both encircled by rings as in the fore wing, the outer rings being fused to resemble the figure 8 lying on its side ; a diffuse, irregular and strongly curved fuscous medial band from the middle of costa to the inner margin at two-thirds from base of wing to base of tail, more strongly pronounced at costa and inner margin and enclosing ocellus ; a submarginal band similar and parallel to the medial band but failing to reach the inner margin ; basal two-thirds of inner margin pale grey speckled with fuscous ; narrow part of tail shaded with fuscous, straighter and longer than in female ; lobe of tail pale pinkish-brown ; fringe

Antistathmoptera daltonae Tams. Male.

R. H. Carcasson.

Adlard & Son, Ltd., Dorking.

darker than in fore wing, without pale areas ; apex less acute than in female, but ends of veins more sharply pointed, especially *M*1.

Underside: Like upperside, but less distinctly marked and with a darker pinkish border to the hindwings.

Length : Fore wing, 67 mm.; hind wing from base to apex, 36 mm.; hind wing from base to extremity of tail, 137 mm.

Neallotype ♂, Tanganyika Territory : Amani, iv.1955 (*C. R. Howard*). In Mr. Howard's collection at Kitale, Kenya Colony.

A NEW SPECIES OF *LITHOCOLLETIS* (LEPIDOPTERA : GRACILLARIIDAE) FROM NEW ZEALAND.

By K. A. J. Wise.

(Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, New Zealand.)

In April 1954, leaf-mines were found on an ornamental creeper, *Hardenbergia* sp., in a garden in Auckland, New Zealand. In January 1955, mined leaves were again taken from the same garden. This infestation has, however, since died out and no further colony is known at present.

Moths which emerged were found to be of an undescribed species of *Lithocolletis*.

Lithocolletis hardenbergiella sp. n.

Blackish with white markings (fig. 1).

Length : 2 mm. *Fore wing :* 2·5 mm.

Head : Front and palpi silver, tuft black. Antennae dark brown to beyond three-quarters, white-tipped ; basal segment without pecten. *Thorax :* Silver. *Fore wing :* Blackish with slight ochreous tinge (caused by dark ochreous scales) ; silver at extreme base. Markings shining white outlined with black ; four costal spots and three dorsal spots ; the first three costal spots closer to base than dorsal spots, first and second pairs unite to form fasciae slightly oblique outwards from costa. Cilia of termen pure white, of apex and tornus, grey. *Hind wing :* Blackish ; cilia grey. *Venation :* Normal ; five veins arise from discoidal cell in fore wing. *Legs :* Blackish. Posterior legs without hairs ; outside of outer spurs white and a white band on tibia at base of each pair of spurs. When the hind leg is folded the tibia lies along the costa of the fore wing and the two white bands adjoin the two fasciae of the fore wing. *Abdomen :* Blackish. In the male, valvae are white and visible ventrally as a terminal white patch. In the female, subterminal segment is white beneath and visible ventrally as a subterminal white patch.

Male genitalia : Tegumen large, pointed at apex with a pair of small protuberances, each bearing a long hair. Ventral longitudinal edges of apical portion of tegumen with short spines. Valvae symmetrical, spinose internally on apical half, the spines arranged in three longitudinal rows. Aedeagus narrowed apically, bluntly rounded at apex. Ventral flap short, broadly rounded apically.

Holotype ♂, allotype ♀, New Zealand : Auckland, Epsom, bred *ex* leaf-mines in *Hardenbergia* sp., 29.iv.1954, emerged 10.v.1954 (*K. A. J. Wise*). (Holotype ♂ genitalia mounted, LMS1/155).

Paratypes, same locality, bred *ex* leaf-mines in *Hardenbergia* sp., 29.iv.1954, 1 ♂, 3 ♀ (*K. A. J. Wise*) ; 25.i.1955, 2 ♂, 8 ♀ (*K. A. J. Wise*). (1 ♂ genitalia mounted, LMS1/142 ; 1 ♀ genitalia mounted, LMS1/141 ; 1 ♀ mounted on 3 slides, LMS1/138, LMS1/139, LMS1/140).

Specimens are in the collection of the Plant Diseases Division, Auckland, except two paratypes lodged in the Zoologisches Museum der Humboldt Universität, Berlin, Germany.

PROC. R. ENT. SOC. LOND. (B) 26. PTS. 1–2. (FEBRUARY, 1957).

The host plant, *Hardenbergia* sp. (Fam. Leguminosae), is an introduced ornamental creeper. It is possible that *Lithocolletis hardenbergiella* is an Australian insect since the genus *Hardenbergia* is endemic to that country.

The larvae, which form lower surface mines in the leaves, are gregarious. At first the mines are linear (Plate I, figs. 3, 4) but as the larvae grow two, three, or four join up their mines to form a large blotch mine (Plate I, fig. 1).

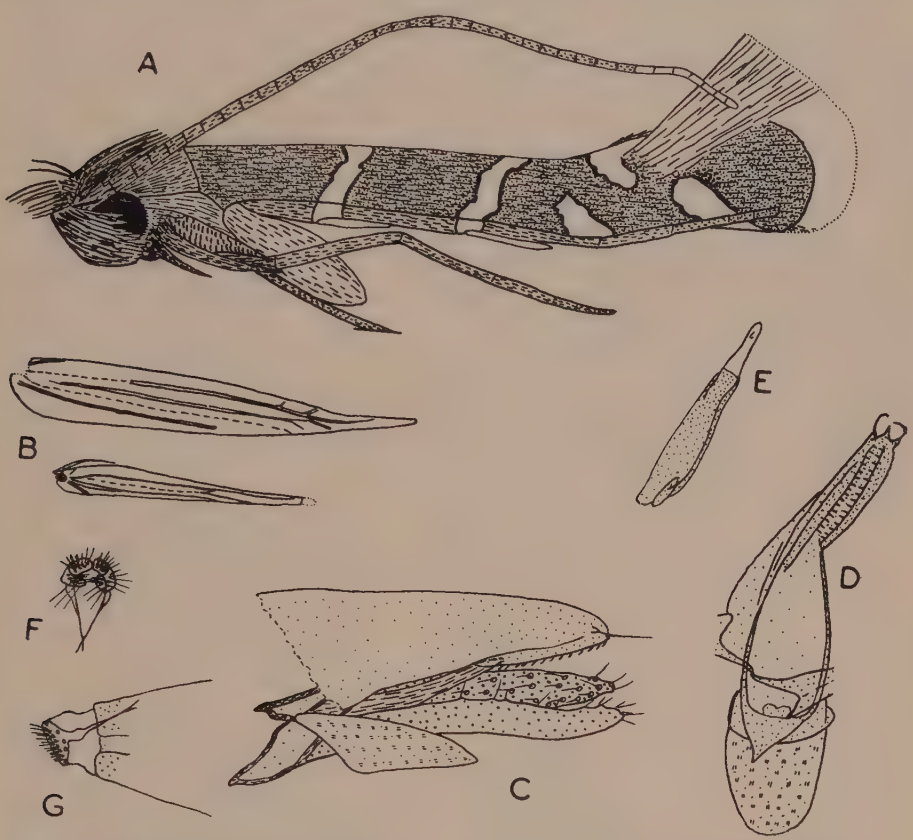


FIG. 1.—*Lithocolletis hardenbergiella* sp. n. (A) Lateral view. (B) Wing venation. (C) Genitalia ♂, lateral (base of aedeagus not shown). (D) Genitalia ♂, caudal (bases of valvae displaced). (E) Genitalia ♂, aedeagus. (F) Genitalia ♀, ovipositor lobes, ventral. (G) Genitalia ♀, ovipositor lobes, lateral.

Inside this, eventually, each larva spins a separate cocoon in which it pupates (Plate I, fig. 3). When emerging the adults may or may not use the same exit hole; the pupal exuviae are left protruding from the mine (Plate I, fig. 2).

Comparison with other species.

The Australian *Lithocolletis desmochrysa* Lower, 1897, which is recorded from *Hardenbergia ovata*, differs from the present species in having three straight golden-metallic fasciae on the fore wing and the apical two-thirds of the antennae

white. The Australian *Lithocolletis aglaozona* Meyrick, 1883, recorded from *Desmodium* sp. (Fam. Leguminosae), differs in having the ground colour of the fore wing ochreous-orange, with the base deep black, and the first and second costal and dorsal spots exactly opposite; the fasciae are straight. Meyrick (1883) stated that this species was allied to the North American *Lithocolletis desmodiella* Clemens, 1859, a species which was later separated as the type of the subgenus *Porphyrosela* by Braun (1908). *L. hardenbergiella* also appears to be close to that species, being similar in wing pattern, the absence of a pecten on the basal antennal segment, the absence of hairs on the posterior tibiae, and the gregarious habit of the larvae. It differs, however, in that the venation is normal, and five veins, not four, as in *Porphyrosela*, arise from the discoidal cell in the fore wing. The present species is distinct from other described Australian species of *Lithocolletis*.

Acknowledgment.

The author wishes to thank Prof. Dr. E. M. Hering, Zoologisches Museum der Humboldt Universität, Berlin, for his continued interest and advice.

Summary.

Lithocolletis hardenbergiella sp. n. is described. Larvae are gregarious in blotch mines on the lower surface of leaves of *Hardenbergia* sp.

References.

Braun, A. F., 1908, Revision of the North American species of *Lithocolletis* Hb. *Trans. Amer. ent. Soc.* **34** : 269–357.

Meyrick, E., 1883, Descriptions of Australian Micro-Lepidoptera. *Proc. Linn. Soc. N.S.W.* **7** : 148–202.

PLATE II.

Fig. 1.—Fully formed blotch mines (× 1⅓).

Fig. 2.—One blotch mine with four pupal exuviae; three are grouped in one exit hole (approx. × 3).

Fig. 3.—Blotch mine opened to show three prepupae in spun cocoons. Linear mines of young larvae also seen (approx. × 3).

Fig. 4.—Linear mines and first stages of blotch mines (× 1⅓).

Photos by J. W. Endt.

Mines of *Lithocolletis hardenbergiella* sp. n. in *Hardenbergia* sp.

K. A. J. Wise.

Adlard & Son, Ltd., Dorking.

ON THE SYSTEMATIC POSITION OF *CYLLECORIS DISPAR* BOHEMAN (HEMIPTERA: MIRIDAE).

By T. R. E. Southwood

(*Department of Zoology and Applied Entomology, Imperial College, London, S.W.*7)

AND

G. E. Woodroffe

(*Pest Infestation Laboratory, Slough, Bucks.*).

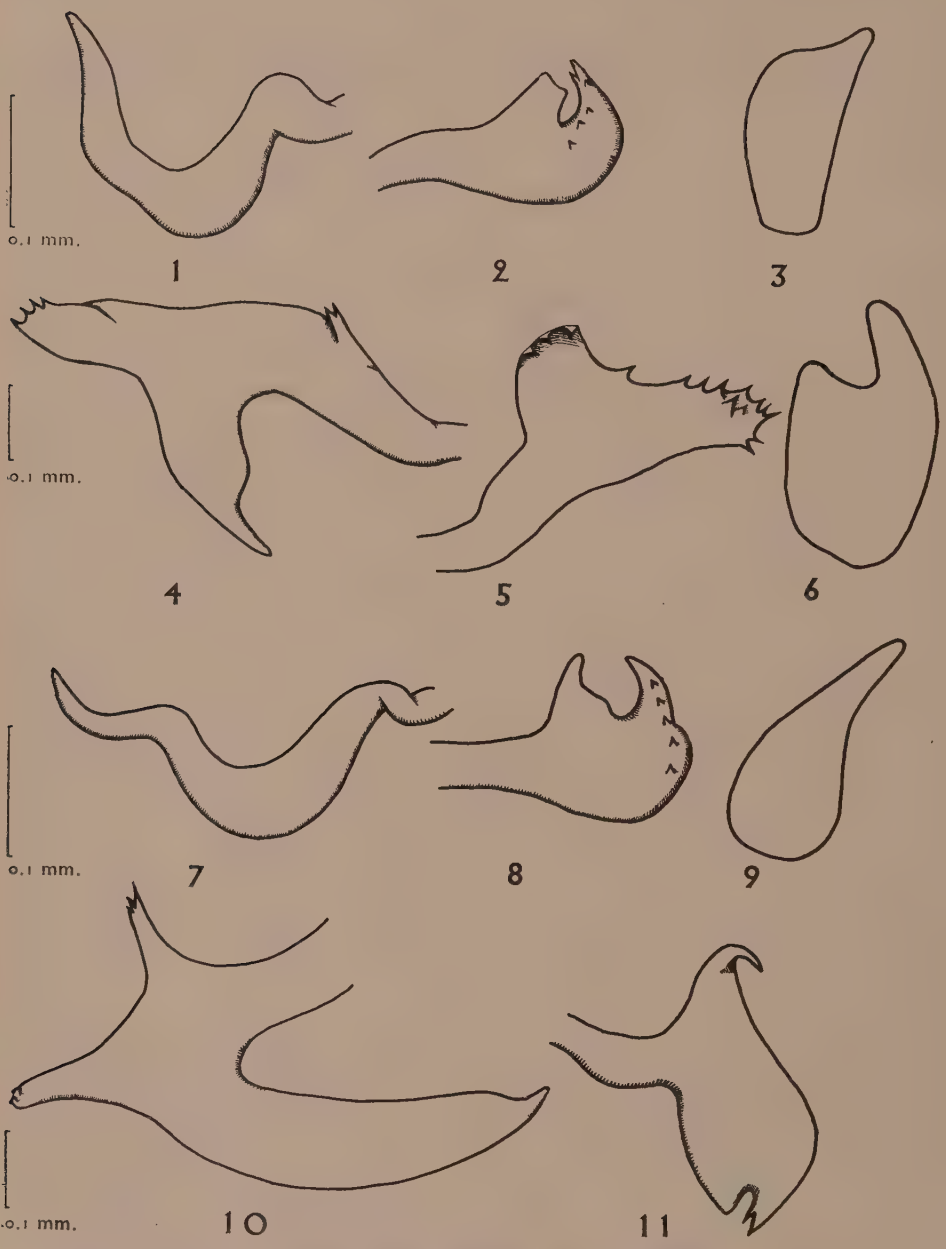
In 1852 Boheman described *Cyllecoris dispar*, a new species from Sweden. Flor (1860) placed it, along with most Mirids, in the genus *Capsus* L., but it is noteworthy that he remarked upon the great similarity between the male and that of *Capsus* (= *Mecomma*) *ambulans* Fallén. Fieber (1860) included *dispar* in the genus *Globiceps* Lepeletier and Serville, and all subsequent workers have followed him. Oshanin (1906) gives *Globiceps subalpinus* Strobl as a synonym of *G. dispar*. Wagner (1952) places *G. dispar* in the subgenus *Kleidocoris* Kolenati with *G. flavomaculatus* Fab. and *G. cruciatus* Reuter.

The male of *Globiceps dispar* closely resembles that of *Mecomma ambulans* and lacks the yellow markings so characteristic of the other members of the subgenus *Kleidocoris* of *Globiceps*. In fact, the only superficial character that would appear to support its inclusion in *Kleidocoris* is the form of the pronotum; this is narrower anteriorly than that of *M. ambulans* and more like that of *G. cruciatus*. However, the pronotum of the male of the recently described *M. orientalis* Carvalho and Southwood is of this type and thus the form of the pronotum cannot be considered a reliable generic character.

Prior to 1955 the female of *Globiceps dispar* was stated to differ markedly from all known *Mecomma* females; but when revising this genus Carvalho and Southwood (1955) described a new species, *M. mimetica*, from British Columbia. The females of this species and those of *G. dispar* are very similar, except that the second antennal segments of the former are partly pale, whilst in the latter they are entirely dark.

Therefore, the evidence from the coloration and appearance of both the males and females of *Globiceps dispar* suggests that it is probably closer to *Mecomma* than to *Globiceps*; this is supported by the genital structure. The K-structures of the bursa copulatrix of the female of *G. dispar* (fig. 3) are of the same type as those of *M. ambulans* (fig. 9) and quite distinct from the indented form found in *G. flavomaculatus* (fig. 6). The left clasper of the male *G. dispar* (fig. 1) is of a simple curved form and the right (fig. 2) is somewhat club-shaped. Both these claspers are much closer in structure to those of *M. ambulans* (figs. 7 and 8) than to those of either *G. flavomaculatus* (figs. 4 and 5) or the type-species *G. sphegiformis* (Rossi) (figs. 10 and 11). In the two last-named the left clasper is more or less trifid and the right is T-shaped.

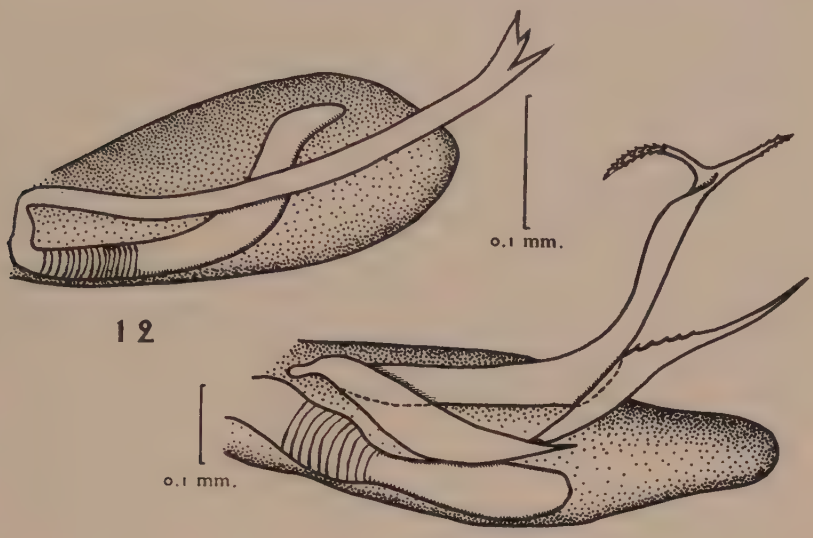
The aedeagus of *G. dispar* (fig. 12) has the vesica curved upwards before the gonopore and only one vesical appendage; Carvalho and Southwood (1955) have shown that this type of structure is characteristic of the genus *Mecomma*.



FIGS. 1–11.—(1)–(3), *Mecomma dispar* Boheman. (1) Left clasper (inner view); (2) right clasper (inner view); (3) K-structure of bursa copulatrix. (4)–(6) *Globiceps flavomaculatus* Fab. (4) Left clasper; (5) right clasper; (6) K-structure. (7)–(9) *Mecomma ambulans* Fallén. (7) Left clasper; (8) right clasper; (9) K-structure. (10)–(11) *Globiceps sphegiformis* (Rossi). (10) Left clasper; (11) right clasper.

It differs markedly from that of *G. flavomaculatus* (fig. 13) and *G. sphegiformis*, which have a straight vesica and three vesicular appendages.

There is thus convincing evidence that the current assignment of *Cyllecoris dispar* Boheman to the genus *Globiceps* is incorrect and it is proposed that the species should now be known as *Mecomma dispar* Boheman **comb. nov.**



Figs. 12–13.—Aedeagus. (12) *Mecomma dispar* Boheman ; (13) *Globiceps flavomaculatus* Fab.

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Book Notice.

Contribution à l'étude des Parasites et Phorétiques de Coléoptères terrestres. Par *Jean Théodoridès.* Supplément No. 4 à *Vie et Milieu, Bull. Lab. Arago.* 8vo. Paris (Hermann et Cie), 1955. Pp. 310, 3 pls., 57 text-figs.

Insects provide a vast field for the study of parasitology in its great variety of forms, and this, the first general review of parasitism and phoresy affecting Coleoptera, constitutes a concise, well-written contribution to the subject. In his preliminary investigations, Dr. Théodoridès examined especially many species of Scarabaeidae, Tenebrionidae, Chrysomelidae, and in addition various Carabidae, Silphidae, Dermestidae and other terrestrial beetles, drawing his material for the most part from South France and Morocco.

After preliminary generalities dealing with nomenclature, techniques employed, lists of Coleoptera examined, and discussion of the principal groups of organisms encountered, the author passes on, in Part II, to consider these latter *seriatim.*

The Sporozoa are represented by the Gregarines, the most constantly encountered group, and the Coccidia. Of the former 36 species are enumerated, and described, 17 of their number being new to science. Without exception they inhabit the mid-gut of the host.

Numerous species of Tenebrionidae act as intermediate hosts to the cysticercoïdes of Cestodes.

Nematodes occur frequently, embracing the full range from simple phoresy to harmful parasitism. They comprise essentially the Rhabditida, with Oxyuroidea, Ascaroidea and Spirurida in smaller numbers. Eight new species are described amongst a total of 36.

Acarines are equally numerous, being either true ecto-parasites or simple phoretics. They include five new species and one new genus.

The entomophagous insects, Hymenoptera and Diptera, fatal to their hosts, are considered briefly, as are the vegetable parasites. The subject of hyper-parasitism and hyper-phoresy is similarly dealt with.

Part III is concerned with the relationship, in all its aspects, between the host and its parasites or phoretics. The former is properly to be regarded as a biotope, or group of micro-media. These, the external surface, the sub-elytral space, the general body cavity, the digestive tract, the genital segment, all provide ecological conditions of wide variety, to each of which are adapted various of the parasitic or phoretic groups. These factors, humidity, temperature, etc., are discussed in some detail, and the populations of the various micro-media enumerated.

Next are discussed the intensity of infestation, and factors influencing it; simultaneous infestations; means of infestation. Host-specificity is a subject of deep interest, and a distinction is drawn between phylogenetic and ethologic attachments. In the former the parasite tends to follow its host throughout its geographic range; in the latter the range of the parasite is limited by factors of ethology and ecology.

The final chapter discusses the importance of beetle parasites and phoretics; their status in the history of zoology; the application of them to agriculture, as in the biological control of pests, to medicine, and to veterinary science; their importance in relation to the fauna of small biotopes.

Dr. Théodoridès is to be congratulated on a pioneer work, giving a lucid introduction to a subject of vast dimensions. A. M. Easton.

THE GENUS *SEMELASPIDUS* MACGILLIVRAY (ASPIDIOTINI : COCCOIDEA : HEMIPTERA).

By D. J. Williams.

(*Commonwealth Institute of Entomology.*)

Many species have been described in the genus *Aspidiotus* Bouché which are now known to belong to an interesting group of genera centred around *Pseudaonidia* MacGillivray. So far as is known all these species have a constriction separating the prosoma from the postsoma, an area of reticulation on the dorsal surface of the pygidium and, usually, a similar area above the vulva. Other genera of this series are *Duplaspidiotus* MacGill., *Neomorgania* MacGill., *Paraonidia* MacGill., *Parrottia* MacGill., *Pseudotargionia* Lindinger and, possibly, *Stringaspidiotus* MacGill.

Two species are at present referable to the genus *Semelaspidus* MacGill., but in neither case has the area of reticulation been mentioned. A search through the pertinent literature and the scale insect collections in the British Museum (Nat. Hist.) reveals that four species are referable to the genus, and it is the object of this paper to show that *Semelaspidus* belongs to the *Pseudaonidia* series.

Bibliography of the Genus *Semelaspidus* MacGillivray.

1921, MacGillivray, A. D., *The Coccidae :* 393. (Gives a short description of the genus to include *Aspidiotus* (*Chrysomphalus*) *cistuloides* Green and *Aspidiotus triglandulosus* Green.)

1921, ——,*Ibid.*: 394. (The genus *Partargionia* is named for *Aspidiotus artocarpi* Green.)

1938, Ferris, G. F., Contributions to the knowledge of the Coccoidea (Homoptera). VII. *Microentomology* **3** : 43, figs. 28, 29. (Illustrates *artocarpi* and *cistuloides*, stating that *artocarpi* was described from immature specimens and suggests that *Partargionia* is a synonym of *Semelaspidus*.)

1939, Takahashi, R., Two new Diaspine Coccidae from India and the Philippines (Hemiptera). *Tenthredo* **2** : 341. (Describes *Semelaspidus mangiferae* and states definitely that *Partargionia* is a synonym of *Semelaspidus*.)

1951, Prabhaker Rao, V., Synonymy of *Semelaspidus artocarpi* (Green). *Proc. ent. Soc. Wash.* **53** : 261. (Places *cistuloides* and *triglandulosus* as synonyms of *artocarpi* and confirms Takahashi's statement.)

Historical Review.

The genus *Semelaspidus* was erected by MacGillivray in 1921 to include *Aspidiotus* (*Chrysomphalus*) *cistuloides* Green and *Aspidiotus triglandulosus* Green. MacGillivray also suggested that *Aspidiotus capsulatus* Green from Java may belong to the genus. This undescribed species is in the Green collection in the British Museum (Nat. Hist.) and belongs to another genus in the *Pseudaonidia* series.

Another species, described by Green as *Aspidiotus artocarpi*, was placed in the genus *Partargionia* by MacGillivray in 1921. This genus was discussed by

Ferris in 1938, who stated that *artocarpi* was described from immature specimens, probably of the species later described in adult form as *cistuloides* and suggested that *Partargionia* may be a synonym of *Semelaspidus*, the latter having page priority. Takahashi, in 1939, describing *Semelaspidus mangiferae*, discussed the second stage female and stated that, as this closely resembled *artocarpi*, the genus *Partargionia* was a synonym of *Semelaspidus*. This was confirmed by Prabhaker Rao in 1951 in an excellent account of the synonymy of *artocarpi*. He found that the species *cistuloides* and *triglandulosus* were synonyms of *artocarpi*.

Geographical Distribution.

Two species, *artocarpi* and *ambalangoda*, are known from Ceylon, whilst *artocarpi* has also been recorded from India. A new species is herein described from Malaya, and *mangiferae*, although collected in Formosa, is recorded as having been imported from the Philippine Islands. This shows a typical Oriental distribution. It seems possible that other species will be collected in these areas and that the genus may be represented in Java and Sumatra.

Definition of the Genus *Semelaspidus*.

Type.—*Aspidiotus* (*Chrysomphalus*) *cistuloides* Green = *Aspidiotus artocarpi* Green.

Synonym.—*Partargionia* MacGillivray.

Recognition characters.—Diaspididae belonging to the tribe Aspidiotini, i.e. with one-barred ducts and without gland spines. Perivulvar pores present or absent but there are always four sclerotised scars in the usual positions of these pores. Four pairs of pygidial lobes present, the fourth varying in shape and size ; usually with short, stout, basal scleroses. Margin beyond the fourth lobes heavily sclerotised, composed of short thickenings of the cuticle resembling paraphyses. Prominent paraphyses present, arising from the inner angles of the lobes, either slender and tapering or stout and distinctly clavate, numbering two to four pairs in the known species ; in the type species the fourth pair lies anterior to the fourth pygidial lobes. Plates shorter than the lobes, slightly fringed at apices, present between the second and third and the third and fourth lobes only.

Body broadly pyriform with a distinct constriction between the prosoma and postsoma. Dorsum heavily sclerotised and possessing one or two pairs of submarginal " bosses " on the abdomen.

Dorsum of pygidium with an area of reticulation, often indistinct but becoming more apparent in correctly stained specimens, lying anterior to the third and fourth lobes and not present on the discal surface. An area of reticulation also present ventrally anterior to the perivulvar pores or the sclerotised scars if the perivulvar pores are absent. Anal opening very narrow, the sides subparallel and situated about one-quarter to one-third the length of the pygidium from the apex of the body. Anterior spiracles each provided with a group of pores.

Scale of female black, slightly convex, circular or subcircular, the shape depending on position on the leaf ; exuviae of first stage larva reddish-brown, usually situated towards one edge of scale.

Male scale much smaller, black, usually oval, the exuviae of first stage larva reddish-brown and central in position.

The second stage female seems to be characterised by a thick, curved, ventral, sclerotised band on the anterior part of the pygidium. It is not yet known whether this is peculiar to this genus.

Notes.—This genus belongs to the group of genera centred around *Pseudaonidia* Cockerell and fits into the subtribe Pseudaonidina as characterised

by Balachowsky (1951, *Les Cochenilles de France, d'Europe, du Nord de l'Afrique et du Bassin Méditerranéen VI*) by possessing a reticulated surface on the pygidium and with a constriction between the prosoma and the postsoma.

It comes closest to the genus *Duplaspidiotus* MacGillivray in possessing long paraphyses on the inner angles of the lobes. The genus differs from *Duplaspidiotus* in the absence of plates between the second and third lobes and in the pattern of the reticulated surface of the pygidium which is more indefinite and never present on the disc, the reticulations being long and pointed. In the known species of *Duplaspidiotus* the reticulated surface occupies the whole of the central part of the pygidium and the reticulations are rounded. There are always two pairs of sclerotised scars in the area of the perivulvar pores in *Semelaspidus* which are absent in *Duplaspidiotus*.

The pygidial margin anterior to the fourth lobes may be a diagnostic character of the genus. It is heavily sclerotised in the form of short thickenings of the cuticle and in the type species, at least, these thickenings resemble the paraphyses in the genera *Melanaspis* Cockerell and *Mycetaspis* Cockerell.

Description of the Species of *Semelaspidus*.

Semelaspidus ambalangoda (Green) (**comb. nov.**). (Fig. 1).

1922, *Aspidiotus ambalangoda* Green, *J. Bombay nat. Hist. Soc.* **28** : 1007.

Host and distribution.—Described from an undetermined shrub from Ambalangoda, Ceylon.

Habit.—Female scale occurring on leaves, especially on the midribs and main veins, varying in shape depending on position, but usually oval, flat, 2·5 mm. × 1·5 mm., with reddish-brown exuviae of first stage larva situated towards one end.

Scale of male black, oval, measuring 1·25 mm. × 0·75 mm., reddish-brown exuviae of first stage larva near centre of scale.

Recognition characters.—Adult female measuring approximately 1·6 mm. long and 1·2 mm. wide on the slide. Dorsum heavily sclerotised, prosomatic region separated from postsomatic region by a distinct constriction ; with two pairs of small, submarginal, sclerotised " bosses " on anterior abdominal segments ; dorsal reticulation of pygidium more pronounced than in other species of the genus, arising from above the first and second paraphyses and meeting anteriorly. Pygidium rounded ; perivulvar pores absent but two pairs of sclerotised scars are present in the normal position of these pores, as illustrated ; four pairs of lobes present, each rounded at the apex and each with a notch on the outer side, the second lobes slightly smaller than median lobes, third and fourth lobes about same size as median lobes ; short, paired, basal scleroses arising from median lobes, and short, single, basal scleroses at inner angles of second and third lobes, a pair of pointed scleroses at base of each fourth lobe ; plates about same length as lobes, a pair between each second and third lobe and three between third and fourth lobes ; three pairs of prominent paraphyses arise from near the inner angles of second, third and fourth lobes, the first pair of paraphyses slender but each with a distinct club at anterior end, second paraphyses stouter and shorter than first pair, clubbed, third pair shorter than second pair, stout and angled ; anteriorly from fourth lobes to setae representing the fourth segment, are short, sclerotised thickenings resembling paraphyses ; dorsal ducts very slender arising from the margin and

Fig. 1.—*Semelaspidus ambalangoda* (Green). *A*, body of adult female; *B*, pygidium of adult female; *C*, pygidial margin, dorsal aspect; *D*, pygidium of second stage female.

becoming shorter anteriorly, a row of duct openings lies anterior to second paraphyses ; anal opening small, sides parallel and situated about one-fourth the length of the pygidium from the apex of the body ; vulva near the anterior end of the pygidium ; anterior spiracles each with a group of nine to sixteen pores.

Notes.—This species closely resembles some species of *Duplaspidiotus* in possessing clavate paraphyses but the species fits well in the genus *Semelaspidus* by the characteristic lobes, plates and lateral scars anterior to the vulva. It differs from *mangiferae*, which is also without perivulvar pores, in possessing three pairs of paraphyses instead of two pairs.

Semelaspidus artocarpi (Green). (Fig. 2).

1896, *Aspidiotus artocarpi* Green, *Ent. mon. Mag.* (2) **7** : 200.
1901, *Targionia artocarpi* (Green), Leonardi, *Riv. Pat. Veg.* **8** : 315–316.
1905, *Aspidiotus* (*Chrysomphalus*) *cistuloides* Green, *J. Bombay nat. Hist. Soc.* **16** : 342.
1908, *Aspidiotus triglandulosus* Green, *Mem. Dep. Agric. India* (*Ent.*) **2** : 33.
1921, *Semelaspidus cistuloides* (Green), MacGillivray, *The Coccidae* : 393, 451.
1921, *Partargionia artocarpi* (Green), MacGillivray, *Ibid.*: 394, 458.
1921, *Semelaspidus triglandulosa* (Green), MacGillivray, *Ibid.*: 451.
1951, *Semelaspidus artocarpi* (Green), Prabhaker Rao, *Proc. ent. Soc. Wash.* **53** : 261.

Hosts and distribution.—Described by Green originally from Bombay, India, on *Artocarpus integrifolia*, subsequently by him under the name *Aspidiotus* (*Chrysomphalus*) *cistuloides* from Peradeniya, Ceylon, on *Cinnamomum*, and finally as *Aspidiotus triglandulosus* from material collected at Mahabaleshwar, Bombay, India, on an undetermined tree. Recorded by Prabhaker Rao from Fraserpet in Coorg, India, on *Artocarpus integrifolia*. Specimens are also at hand collected by T. B. Fletcher at Bangalore, Mysore, India, on *Artocarpus integrifolia* and also from the same locality and host collected by G. P. C. Basavanna, January and December, 1955.

Habit.—Scale of female moderately convex, oval, 2·5 mm. × 1·5 mm., the ventral scale elevated at one end and overlapping the dorsal scale ; exuviae of first stage larva reddish-brown and situated towards one end ; male scale black, elongate 1·25 mm. × 0·75 mm.

Recognition characters.—Adult female measuring approximately 1·3 mm. × 1·00 mm. on the slide. Dorsum heavily sclerotised with a constriction between prosoma and postsoma. Two pairs of submarginal, sclerotised " bosses " present on anterior abdominal segments. Reticulated surface of pygidium arising above third and fourth lobes. Pygidium broadly rounded ; perivulvar pores in three groups, median group with 2–6 pores and lateral groups situated between sclerotised scars each with 5–12 pores ; four pairs of well-developed lobes present, the median pair rounded, the second pair, notched laterally, smaller than median pair, third pair larger than median pair, each with a lateral notch, fourth pair quadrate with distal serrations, the lateral edges merging with pygidial margin ; short, paired, basal scleroses arising from median lobes, short, single, basal scleroses at inner angles of second and third lobes, numerous slender scleroses at bases of fourth lobes ; plates slender, shorter than lobes and situated as follows : one arising from inner angle of each third lobe and three between each third and fourth lobe ; long paraphyses present arising from inner angles of second, third and fourth lobes and another pair arising anterior to the fourth lobes ; the first paraphyses long, slender and slightly curved, the second paraphyses similar in shape to first but shorter, third paraphyses shorter than second and

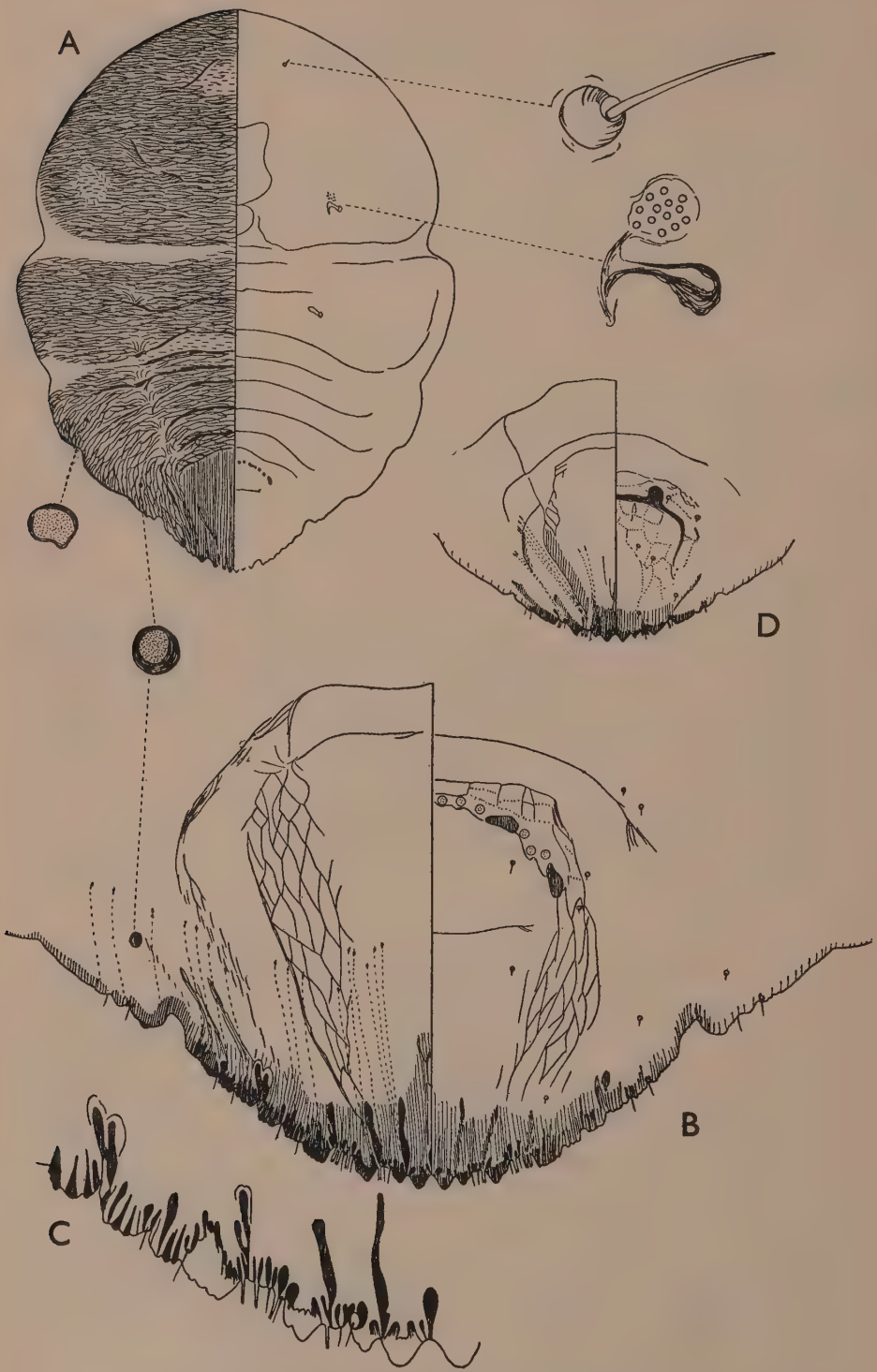


FIG. 2.—*Semelaspidus artocarpi* (Green). Lettering as in fig. 1.

with short projections on outer edges, fourth paraphyses paired ; anteriorly, from fourth lobes to beyond the setae representing the fourth segment, are short sclerotised thickenings resembling paraphyses ; dorsal ducts arising from the margin, very slender, becoming shorter anteriorly ; anal opening located just anterior to the level of the top of the first pair of paraphyses ; vulva situated in the centre of pygidium ; anterior spiracles each with a group of 12–35 pores.

Notes.—This species differs from all others in the genus in possessing four pairs of long paraphyses and a very characteristic pygidial margin. This is heavily sclerotised and composed of slender thickenings resembling the paraphyses of the genus *Melanaspis* Cockerell. In some specimens examined the lobes are more quadrate than in the type specimens. The number of perivulvar pores is very variable but there is no reason to suspect that more than one species is involved.

Semelaspidus mangiferae Takahashi.

1939, *Semelaspidus mangiferae* Takahashi, *Tenthredo* **2**: 341–343.

Host and distribution.—Described from *Mangifera indica* on plants imported from the Philippine Islands and taken by plant inspectors in March 1933, at Takao, Formosa.

Habit.—Occurring on the upper surfaces of the leaves along the midribs. Scale of adult female described as : " black, slightly brownish, not shiny, thick, subcircular or elliptic, convex dorsally, about 1·0 mm. long ; marginal area of venter not separated from the host. Larval skins at the center, or at the apex of convex dorsum."

Recognition characters.—No specimens of this species have been seen by the author but it is understood that the types are in Formosa. The following description is taken from Takahashi (1939) : " . . . (*Body*). Wide, broadest on the mesothorax, with some small setae scattered on the submarginal area of cephalothorax, which are much shorter than the antennal bristles ; body segments distinct. In the young adult at least, body not sclerotised except on the pygidium, not distinctly constricted on the cephalothorax. Mesothorax with numerous minute granules in transverse rows, and many small circular pores on the venter ; the pores each with a thin duct ; about 10 similar pores very loosely scattered behind each posterior spiracle. Abdominal segments with many thin lateral glands ; many small circular pores scattered on the sublateral part of the basal part of venter of abdomen. Antennae with a very long seta. Anterior spiracles with 4–6 parastigmatic pores. A pair of small setae present between the antennae. (*Pygidium*). Strongly sclerotised on the wide median area of dorsum, the area distinctly defined, without lines, reaching the base of pygidium. Anal opening small, very narrow, longitudinal, much nearer to the hind end than to the genital opening. 2 slender paraphyses present on each side, the mesal pair much longer than the other, reaching the anal opening. About 2 slender sclerotised parts present on each side of the large median sclerotised part of dorsum. Venter with about 4 pairs of sclerotised parts, a few minute circular pores, and many mosaic-like structures post-laterad of the genital opening ; circumgenital pores absent. Genital opening nearer to the base than to the apex. Median lobes small, wide, wider than long, broadly rounded apically, notched on each side, separated, parallel, slightly larger than the 2nd lobes ; the 2nd lobes similar in shape to the median ; the 3rd almost similar to, but a little larger than, the median, rounded on the outside, rounded or a little pointed apically ; the 4th represented by prominences ; a few small spines present between the 2nd and 3rd lobes, and between

the 3rd and 4th, which are shorter than the lobes. About 5 marginal setae present on each side, of which the posterior 3 are stout, reaching to or beyond the apices of lobes ; about 4 very small submarginal setae present on each side of dorsum."

Notes.—This species seems to belong to the genus *Semelaspidus*. Although Takahashi does not mention the reticulation on the dorsal surface of the pygidium it seems evident that there is such an area, as in other species of the genus. The species differs from all the others discussed in possessing only two pairs of paraphyses, these being slender and apparently not clavate or swollen at the anterior end.

Semelaspidus theobromae sp. n. (Fig. 3).

Hosts and distribution.—On leaves of *Theobroma cacao*. MALAYA : Johore, Niyor, 14.x.1947 (*H. T. Pagden*).

Habit.—Scale of female black, slightly convex, subcircular, about 2 mm. in diameter, the shape and size depending on position along the midrib and main veins. Exuviae of first stage larva reddish-brown, situated towards one edge. Occurring on both sides of the leaves.

Male scale elongate, 1·25 mm. × 0·5 mm., exuviae of first stage larvae situated near the centre.

Recognition characters.—Adult female measuring approximately 1·25 mm. × 1·00 mm. on the slide. Dorsum heavily sclerotised with a constriction separating the prosoma from the postsoma ; a pair of small, submarginal, sclerotised " bosses " on the anterior part of abdomen. The reticulation of pygidum arising anterior to third lobes, indistinct, not present on the disc. Pygidium rounded ; perivulvar pores present in an arc at anterior end, 5–10 pores between the inner sclerotised scars, 5–9 pores between each lateral pair of scars and one or two pores posterior to postero-lateral scars ; four pairs of lobes present similar to those of other species in the genus, second lobes slightly smaller than median lobes, third lobes about same size as median lobes, each with a notch on outer margin, fourth lobes largest, dentate on distal margins ; median lobes each with a pair of short, stout, basal scleroses, second and third lobes each with a short basal sclerosis at inner angle, fourth lobes with a few pointed scleroses ; short, sclerotised marginal thickenings anterior to the fourth lobes not so well developed as in other species of the genus ; plates about same length as lobes, one arising between each second and third lobe, three between each third and fourth lobe ; three pairs of paraphyses present arising near inner angles of second, third and fourth lobes, the first paraphyses stout and slightly clavate, the second paraphyses slender at the margin and becoming stouter anteriorly, shorter than first paraphyses, third pair shortest ; dorsal ducts very slender, becoming shorter anteriorly, a row of what appear to be duct openings arising anterior to second paraphyses ; anal opening narrow, sides subparallel, situated about one quarter the length of the pygidium from the apex of the body ; vulva located towards anterior end of pygidium ; anterior spiracles each with 8–15 pores.

Notes.—This species is probably nearest *mangiferae* but differs in possessing perivulvar pores and three pairs of paraphyses instead of two pairs. The species *artocarpi*, although possessing perivulvar pores, has four distinct pairs of paraphyses and the sclerotised thickenings anterior to the fourth lobes are much more developed than in *theobromae*.

Holotype and paratypes deposited in the British Museum (Nat. Hist.).

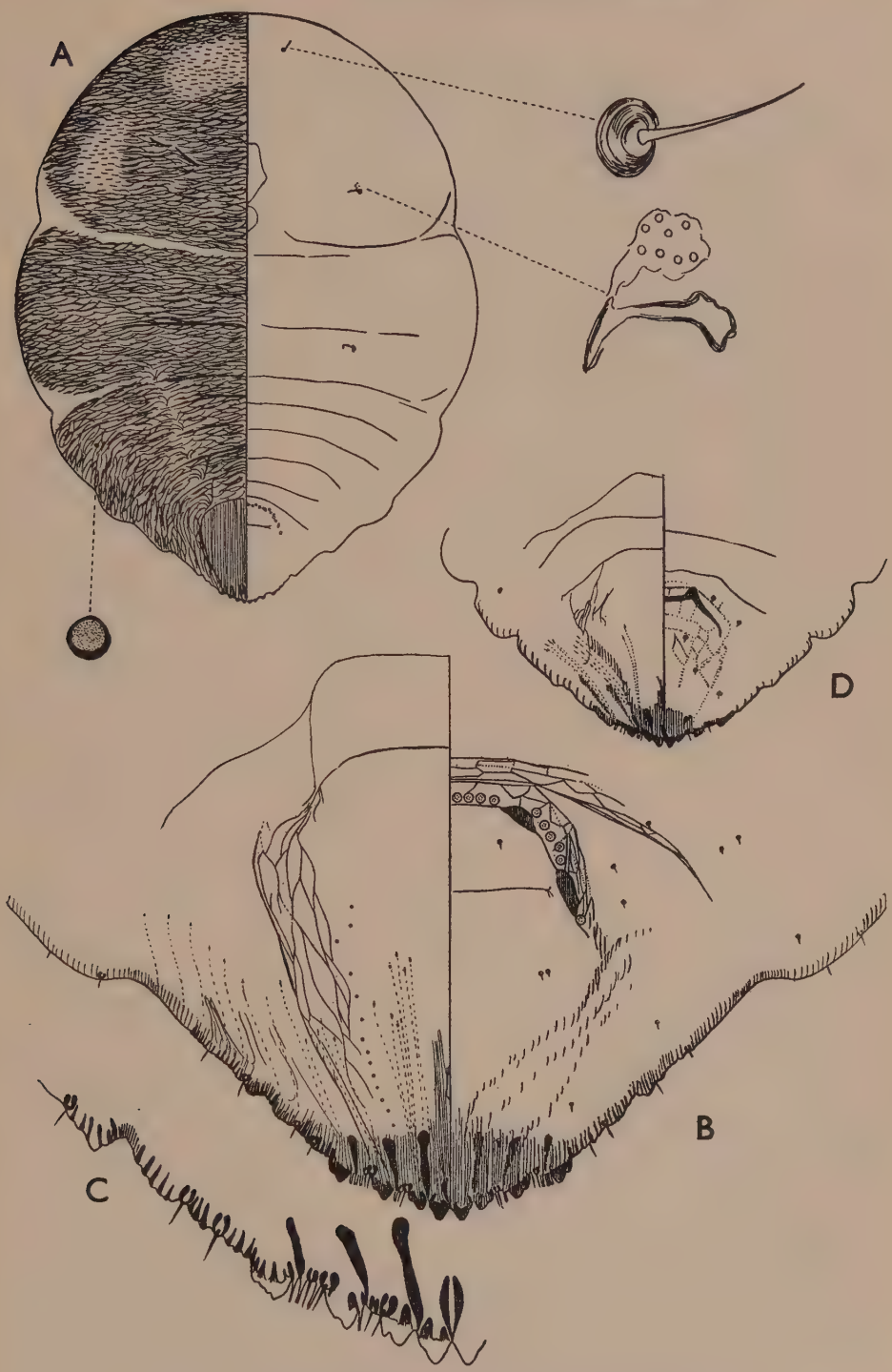


FIG. 3.—*Semelaspidus theobromae* sp. n. Lettering as in fig. 1.

Key to Species of *Semelaspidus*.

1 Perivulvar pores present 2
Perivulvar pores absent 3

2 (1) With three pairs of paraphyses, arising from the inner angles of the second, third and fourth lobes . . . . . **theobromae** sp. n.

3 With three pairs of paraphyses arising from the inner angles of the second, third and fourth lobes and another pair arising anterior to the fourth lobes . . . . . **artocarpi** (Green)

3 (1) With two pairs of slender paraphyses arising from the inner angles of the second and third lobes . . . . . **mangiferae** Takahashi
With three pairs of paraphyses arising from the inner angles of the second, third and fourth lobes, the two inner pairs being distinctly clavate . . . . . **ambalangoda** (Green)

NEW RECORDS AND SPECIES OF *EUTHRAULUS* BARNARD (EPHEMEROPTERA) FROM EAST AFRICA AND THE ORIENTAL REGION.

By M. T. Gillies.

Barnard (1932) created the genus *Euthraulus* (Leptophlebiidae) for a South African mayfly resembling in certain respects the European *Thraulus bellus* Eaton. It differed in the adult in possessing genital forceps strongly swollen basally and, in the nymph, by the first gill being single and filiform and the lamellae of the second to seventh gills being tri-digitate. This species, *E. elegans*, is common in Cape Province (Barnard, 1932), in the South Eastern Cape and Natal (Crass, 1947*a*, *b*) and has recently been collected in Nyasaland (Kimmins, 1955*a*). Two other species have recently been described from Uganda, *E. bugandensis* and *E. curtus* (Kimmins, 1955*b*), both of them occurring in the vicinity of the northern shore of Lake Victoria and the source of the Nile.

Earlier in the century, Ulmer (1913) described *Thraulus marginatus* from a series of males from Java. In his impressive work on the Ephemeroptera of the Sunda Islands Ulmer (1939) discussed the status of this species and decided to create the new genus *Thraululus* for it. The present writer (Gillies, 1951) added a second species, *Thraululus parvulus*, from material collected in Central India. The nymphs of both were unknown. In 1928 Uéno had described *Choroterpes trifurcata* from Formosa, on the basis of a series of nymphs the gills of which terminated in three long processes. Ulmer (1939) recorded the presence in Java of nymphs thought to belong to this species, and it may be noted that he remarked then on the similarity of the gills of these specimens to those of *Euthraulus*.

Soon after coming to East Africa I had the opportunity of collecting a number of specimens of *Euthraulus*, both as nymphs and adults, and the similarity between the African adults and the Indian species previously studied led to the suspicion that *Euthraulus* and *Thraululus* were synonyms. A comparison of Uéno's description with East African material confirmed the similarities between the nymphs, and a re-examination of some of my Indian material revealed the presence of typical *Euthraulus* nymphs from several localities. The position, therefore, is that *Thraululus* adults are indistinguishable from *Euthraulus*, and that *Euthraulus* nymphs—*Choroterpes trifurcata* and undescribed material—are known to occur in the Oriental region. Thus, even without the confirmatory evidence that might be supplied by knowledge of the early stages of *Thraululus*, it seems clear that *Thraululus* Ulmer is a synonym of *Euthraulus* Barnard, and that the Oriental nymphs with tri-digitate gill lamellae also belong here.

The distinctive characters of the genus are the marked reduction of cross-veins in the fore wing, the ovate hind wing with prominent rounded spur, the basal segments of the male forceps strongly and abruptly swollen basally, the penes separate and simple, and the female subanal plate with a distinct apical notch. The labrum of the nymph has a single deep median notch in the anterior margin, the first gill simple and filiform and both lamellae of gills 2–7 terminating in three fine processes.

List of species of *Euthraulus* Barnard, 1932 (= *Thraululus* Ulmer, 1939) **syn. nov.**

E. elegans Barnard, 1932	Cape Province and Natal; S. Africa; Nyasaland.
E. bugandensis Kimmins, 1955*b* . .	Uganda; Tanganyika.
E. curtus Kimmins, 1955*b* . . .	Uganda.
E. tropicalis sp. n.	Tanganyika.
E. usambarae sp. n.	Tanganyika.
E. marginatus (Ulmer, 1913) **comb. nov.**	Java.
E. parvulus (Gillies, 1951) **comb. nov.**	India.
E. trifurcatus (Uéno, 1928) **comb. nov.**	Formosa.
Euthraulus sp. Undescribed nymphs	India; Hong Kong.

Of the Oriental species, it is possible that *trifurcatus* represents the nymph of either *marginatus* or *parvulus*. Alternatively, the nymphs from Java designated as *trifurcatus* by Ulmer (1939) may, in fact, belong to *marginatus*. Ulmer himself observed several differences in the mouthparts between his specimens and the Formosa species, which indicate the probable distinctness of the two forms. I have a series of nymphs from Hong Kong, kindly collected for me by Mr. M. V. Lunn. These differ from *trifurcatus* Uéno in several small details, and the prostheca has two main branches in *both* mandibles, thereby differing from *trifurcatus* Ulmer (*nec* Uéno). The Hong Kong species may also be distinct. Other nymphs in my collection came from Rawalpindi, in the north-west of the Indian sub-continent, and from Poona. It seems then that *Euthraulus* is widespread and common throughout the Oriental region.

It is equally widespread in Africa. Apart from the records already mentioned, I have recently collected nymphs from the River Congo at Leopoldville and Brazzaville and from a number of streams in Liberia. Notes on some East African species follow, two of them being described as new. The types of both have been presented to the British Museum (Natural History).

Euthraulus bugandensis Kimmins.

Tanganyika: Korogwe, Tanga Province, on the Pangani River (alt. *c.* 900 ft.).

A number of specimens were caught as subimagines at light on 23rd August, 1955. These are rather smaller than as described by Kimmins, but the male genitalia agree very closely with his figures. An enlarged drawing of one penis lobe is reproduced here (fig. 1) in order to show the detail. The subimago in life has pale grey wings. This is a distinctly larger and paler species than the other East African forms known to me.

Euthraulus tropicalis sp. n. (Figs. 2–5, 8–9).

Male imago.—*In life:* Eyes chocolate-brown, body and tails rather darker. Fore femur dark brown, tibia grey-brown, tarsus white; mid and hind femora dark brown, slightly paler and translucent in the basal one-third, tibiae and tarsi dark grey. Wings unpigmented except for a patch of dark brown pigment at the base of the hind wing.

In fluid: Turbinate eyes coffee coloured, not quite contiguous. Thorax dark brown; fore femur dark brown, tibia paler brown, tarsus almost colourless; mid and hind legs

dark brown, basal pale banding of femora scarcely discernible. Abdomen and tails dark brown. Genitalia as in figures 4–5 ; distal half of penis lobes subtriangular, the apex bearing three to four sharp spines, main portion unornamented except for a few fine translucent pale spots.

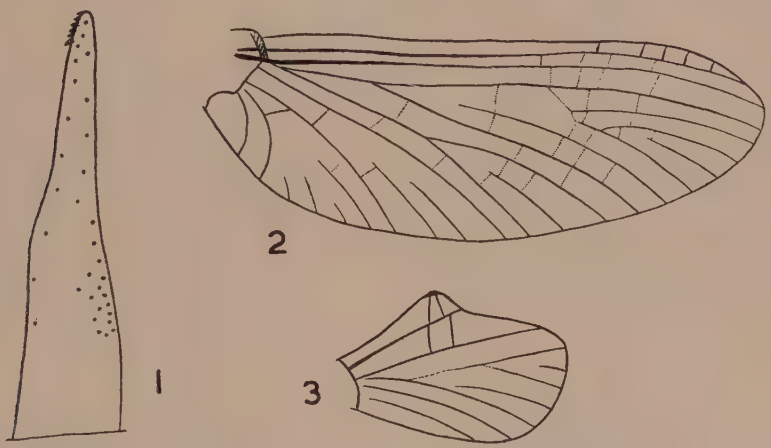
Female imago.—*In life :* A darker insect than the male, body uniformly dark pitch brown, tails almost black ; femora and tibiae pitch brown. Wing venation rather darker than in male and cross-veins more distinct.

In fluid : Colouring as in male.

Subimago.—*In life :* Wings iron blue, body dark greyish-purple.

Body length (both sexes) 5 mm. Wing 5·5–6 mm.

Nymph.—Uniform dark brown. Mouthparts : labrum 1·8–2 times as wide as deep, notch shallow, upper hair fringe subparallel to lower and nearer anterior than posterior margin of labrum ; inner canine of right mandible with only two prongs and prostheca



Figs. 1–3.—(1) Penis lobe of *E. bugandensis* Kimmins.
(2–3) Fore and hind wings of *E. tropicalis* sp. n.

reduced. Legs : peg-like spines on upper surface of fore femur more or less continuous from median area to the apex, and distributed along both anterior and posterior margins, many of them being serrated ; tibiae and tarsi generally well clothed with hairs ; hind tarsus with eight to ten narrow spines on anterior margin.

Eggs.—Cream coloured, elongated, the chorion ornamented with a pattern of star-shaped bosses, each with seven to eight irregular raised ribs radiating from the centre.

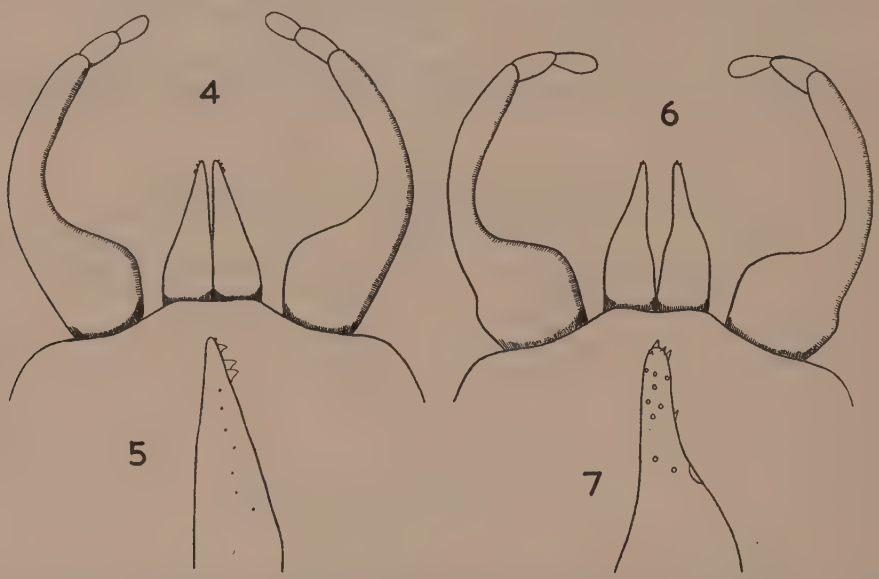
Holotype ♂, paratypes, Tanganyika : Mombo, Tanga Province (*c.* 1200 ft.), x. 54. Tengeni and Muheza, Tanga Province (*c.* 600 ft.). Nymphs, probably of this species, have been found in Zanzibar.

This species is noticeably darker than *usambarae* sp. n., and the genitalia are quite distinct. The nymph is readily distinguished by the distribution of the peg-like spines on the fore femora and by the relatively deeper labrum. From *bugandensis* it may be distinguished by its darker colour, smaller size and by the male genitalia. From *curtus* it may again be distinguished by the darker colour and the genitalia. From *elegans* it differs in the genitalia of the male and in the greater number of spines on all femora in the nymph.

Euthraulus usambarae sp. n. (Figs. 6–7, 10–11).

Male imago.—*In life :* A uniform dark brown insect ; fore femur and tibia dark brown, tarsus white ; mid and hind femora pale in basal one-third, dark brown in distal two-thirds, in which there is a pale interruption, tibiae and tarsi white. Tails brown with reddish annulations.

In fluid : Oculi chocolate-brown. General colouring as in life. Wings much as in preceding species. Basal segment of forceps with a prominent bulge on the outer margin near



Figs. 4–7.—(4) Male genitalia and (5) detail of penis of *E. tropicalis* sp. n. (6) Male genitalia and (7) detail of penis of *E. usambarae* sp. n.

its base ; penes tapering sharply at about three-fifths of the distance from base to apex, a few small spines present, mainly at extreme apex.

Female imago.—General colouring as in male.

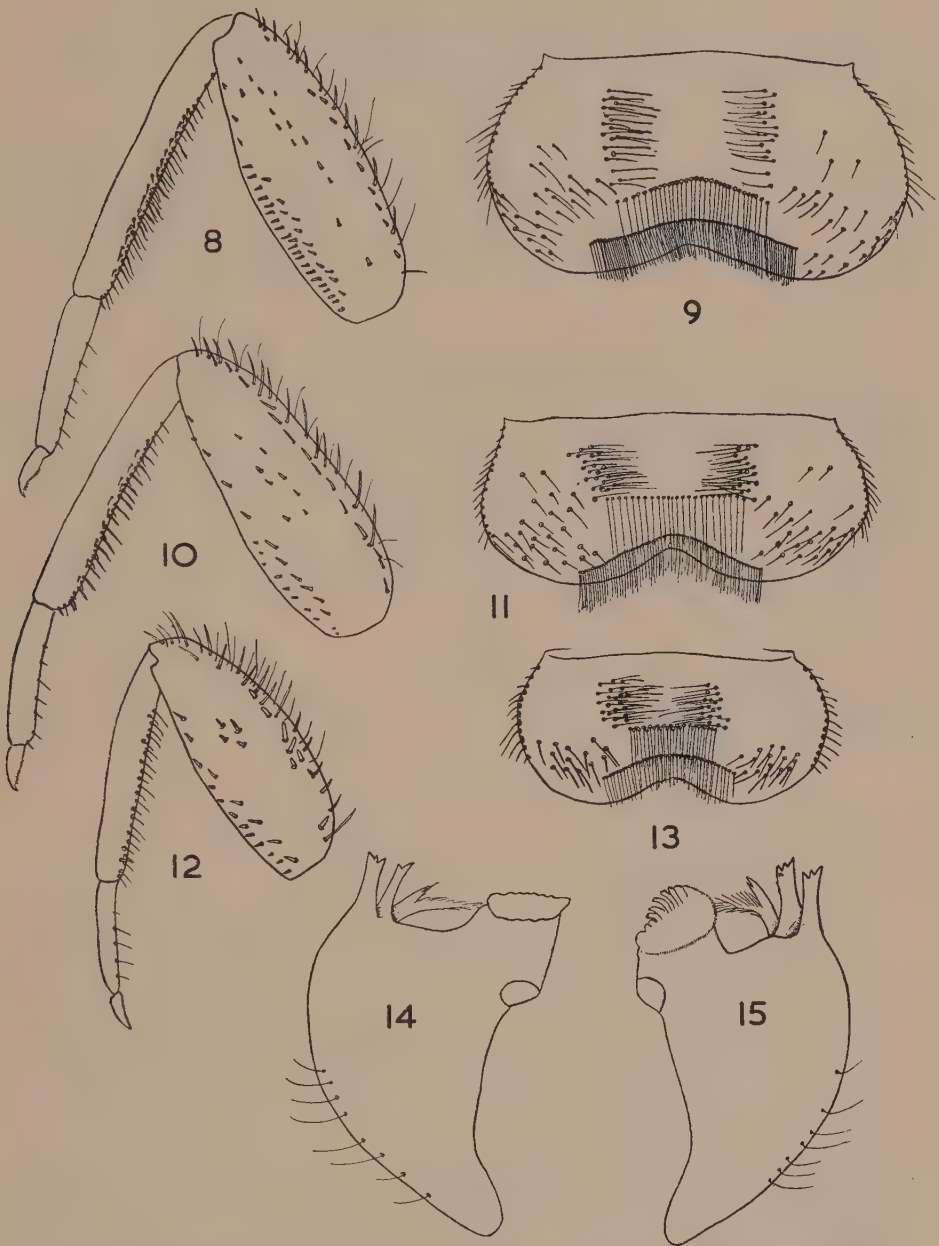
Body length (both sexes) 4–4·5 mm. Wing 4–4·5 mm.

Nymph.—Uniform dark brown. Mouthparts : labrum 2·2–2·4 times as wide as deep, notch deeper than in *tropicalis*, posterior hair fringe more nearly straight and about equidistant between anterior and posterior margins of labrum ; mandibles much as in *tropicalis*. Legs: peg-like spines on fore femur confined to a small median patch on the upper surface and along most of the length of the anterior margin ; on the posterior margin they are mainly replaced by long, thinner spines. Hind tarsus with four to six spines on anterior margin.

Holotype ♂, Tanganyika : Mpandeni, 20.vi.55 ; paratypes, Sigi River and other streams draining the Eastern Usambara Mountains, Tanga Province, from Amani (alt. 3000 ft.) to near Muheza (*c.* 600 ft.).

This species is rather paler than *tropicalis* and there are marked differences in the genitalia. The nymph is readily distinguished by the reduced number of peg-like spines on the fore femur and by the shallower labrum. From *curtus* and *bugandensis* it differs in the genitalia and darker colouring. The penes are similar perhaps to those of *elegans* (Barnard's figure does not show the finer

details), but the swollen base of the proximal forceps segment, particularly on the outer side, and the elongate terminal segment should serve to distinguish it. The apparent absence of *usambarae* from the neighbouring South Pare



FIGS. 8–15.—(8) Fore leg of nymph, (9) labrum of *E. tropicalis* sp. n. (10) Fore leg of nymph, (11) labrum of *E. usambarae* sp. n. (12) Fore leg of nymph, (13) labrum, (14–15) right and left mandible of *Euthraulus* sp. A.

Mountains suggests that, like a number of plants and animals found in the Usambara Mountains, it has a very restricted distribution.

Euthraulus sp. A. (Figs. 12–15).

Nymphs of another species occur in the Sasseneh River at Kihurio, South Pare District. The labrum, mandibles and fore leg are figured here. This species shows a further reduction in the number of peg-like spines on the fore femur.

Euthraulus sp. B.

Adults and nymphs from the South Pare Mountains of Tanganyika and from the lower slopes of Kilimanjaro rather closely resemble the lowland species, *E. tropicalis*. But close examination of the genitalia has shown that they probably belong to a distinct species, the description of which must await further material.

Euthraulus appears to be the commonest Leptophlebiid to be found in small streams in East Africa, particularly at lower altitudes. It is far from being exclusively a torrential form. *E. tropicalis*, for instance, is normally found in sluggish streams, the temperature of which has been observed to reach at least 85° F. in the hot season, and which may become reduced to almost stagnant pools during part of the dry season. It is possible that this ability to survive temporarily low oxygen tensions may be responsible for the very clear cut differences in the distribution of *tropicalis* and *usambarae* in lowland streams at the foot of the Usambara mountains. *E. usambarae* occurs sparingly in permanent cooler streams, while *tropicalis* is often found in great abundance in streams the flow of which is more seasonal.

Summary.

The Oriental genus *Thraululus* Ulmer is shown to be a synonym of *Euthraulus* Barnard, which has a wide distribution in Africa. Two new species are described from Tanganyika.

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A NEW SPECIES OF ENTOMOBRYIDAE FROM INDIA (COLLEMBOLA).

By J. T. Salmon.

(*Victoria University College, Wellington, New Zealand.*)

The Collembolan described in this paper was collected by Mr. H. F. Lamprey from Tehri Garwal, Rudugira Gael, Central Himalayas, at an altitude of 13,400 ft. The specimens were forwarded to me by Dr. T. Clay of the British Museum (Natural History) and I am indebted to both Dr. Clay and Mr. Lamprey for the opportunity to study this material.

In addition to this new species the collection contained three damaged specimens of *Sinella montana* Imms.

Pseudentomobrya lampreyi sp. n. (Figs. 1–3).

Colour.—In alcohol, entirely very dark brown to brownish-black; ocellar fields black, a black spot on front of head between antennae with sometimes diffuse black pigment passing as a narrow line from this around the antennal bases to the ocellar fields. Legs, antennae and furcula generally a paler shade than the body.

Figs. 1–3.—(1) Ocellar group, (2) foot claw, (3) mucro and apex of dens. Scale same for all figures.

Clothing.—Typical of the genus, with many both short and long ciliated setae on the body and appendages and many flexed setae dorsally on the head, thorax and anterior portion of abdomen.

Body.—Length up to 1·2 mm. Antennae about half as long again as head, the four segments related as 7 : 11 : 11 : 20. Ant. IV with small apical sensory knob and clothing of short ciliated setae, amongst which are scattered shorter tapering straight sense rods. Ant. III with longer ciliated setae and occasional similar sense rods. Ant. II with setae similar to

Ant. III without the tapering sense rods but with two to three shorter, curved, exposed sense rods on the basal third. Ant. I with moderately long setae only. Ocelli eight to each side, all fairly large, as in figure 1. Abd. IV approximately four times longer than Abd. III. Tenaculum absent.

Legs.—Claw with a pair of small outer lateral teeth about one-third down, a pair of strong inner teeth about half-way down, a single inner tooth at two-thirds down and a smaller distal tooth between this and the claw apex but nearer to this tooth than to the apex. Unguiculus lanceolate, reaching to single inner tooth of claw. A single clavate tenent hair subequal in length to claw on each foot.

Furcula.—Manubrium to mucrodens as 106 : 125. Uncorrugated portion of dens 3 × length of mucro, finely serrated and extending as a lamella on to base of mucro ; mucro bidentate with basal spine, the subapical tooth a little higher than the apical and overtopped by the basal spine ; the mucro generally rather plump, the dens widening noticeably from the mucro, which is incompletely separated from the dens. Mucro slightly overreached by long ciliated setae.

India, Central Himalayas : Tehri Garwal, Rudugira Gael, 13,400 ft. (*H. F. Lamprey*).

Holotype.—Marked specimen on slide deposited in the British Museum (Natural History). This specimen is one of two mounted on the same slide, and is complete except for the antennae. The other specimen on the slide is more badly damaged. *Paratypes* of four incomplete specimens in the author's collection. The above description is based on all the specimens.

A REVISION OF THE GENUS *DERMOLEPIDA* (COLEOPTERA : MELOLONTHINAE).

By E. B. Britton.

(*Department of Entomology, British Museum (Natural History).*)

Specimens of two species of *Dermolepida* were recently sent to the Commonwealth Institute of Entomology by Dr. J. Szent-Ivany, Entomologist to the Department of Agriculture, Stock and Fisheries, Port Moresby, Papua. The specimens were referred to me for identification. One of the species, reported as a serious pest in cocoa plantations, proved to be new. As the discovery of this fact involved a survey of all the known species and because I believe that isolated descriptions of new species should be avoided, I have taken the opportunity of presenting the following revision of the genus.

Dermolepida Arrow.

Dermolepida Arrow, 1941, *Ann. Mag. nat. Hist.* (11) **7** : 448.
Lepidoderma Waterhouse, 1875, *Trans. ent. Soc. Lond.* **1875** : 201 ; Blackburn, 1912, *Trans. roy. Soc. S. Aust.* **36** : 52.
Lepidioderma Brenske, 1894, *Soc. ent.* **9** : 41.

The genus was described by Waterhouse as *Lepidoderma* but, as this was preoccupied by *Lepidoderma* Reuss, 1855 (Trilobita), the name was changed to *Dermolepida* by Arrow in 1941. *Lepidioderma* Brenske is not available as it is clearly an erroneous spelling of *Lepidoderma*.

Dermolepida is included in the Melolonthini because the spurs of the posterior tibia are placed close together, the labrum is below the clypeus, the claws have a strong tooth beneath and the abdominal ventrites (except the last) are fused in the middle.

Dermolepida is distinguished from related genera by the following characters : (*a*) the large, strong, asymmetric mandibles which are clearly visible from in front, extending below and beyond the sides of the labrum, the apices of the mandibles being curved backwards beneath the apices of the maxillae ; (*b*) the antennal club which is 5-lamellate in the male and 4-lamellate in the female ; (*c*) the large size, the body length being not less than 24 mm.; (*d*) the presence on the dorsal and/or ventral surface of at least a few pale coloured scales.

Type species : *Dermolepida albohirtum* (Waterhouse) by monotypy.

In the original description of *Lepidoderma* the genus was treated as neuter. Arrow, in re-naming the genus, did not indicate the gender of *Dermolepida*, and in order to avoid changes in the terminations of the specific names I have chosen to treat the latter name as neuter.

Twelve species have been placed in this genus. In the present work these are reduced by synonymy to eight species, and three new species are added.

I am grateful to Dr. R. Hertel of the Staatliches Museum für Tierkunde, Dresden, for making possible the identification of the species described by Brenske.

The distribution of *Dermolepida* is centred on New Guinea, with extensions into neighbouring islands and northern Queensland.

Key to the Species of *Dermolepida*.

1 Pygidium and ventral surface of the abdomen uniformly clothed with short, fine, recumbent, whitish hairs; elytra with single, broad, white scales set among a general clothing of short, whitish or yellowish hairs or very narrow, acutely pointed scales; tarsi pale yellowish-brown, the segments dark brown or black at their distal ends 2

Pygidium and ventral surface of the abdomen with patches of whitish scales and without a general clothing of short fine hairs; elytra bare or with white or yellow scales but without a general clothing of short fine hairs or very narrow scales in addition to the broad scales; tarsi uniform brown or black 4

2 (1) Frons with a few large whitish scales on each side between the eyes, contrasting with the general clothing of short yellowish hairs; frons without long, backwardly-directed yellow setae; anterior edge of the pronotum with a few short erect setae near the lateral angles but not on the middle third; elytra without long erect setae on the disc; length 25–33 mm. Northern New Guinea . . . 3

Frons without contrasting white scales, but with long, backwardly-directed yellow setae; anterior edge of the pronotum with stout, erect, yellow setae on the middle third but not towards the lateral angles; elytra with a few very long and very stout, erect, yellow setae on the disc; length 26–35 mm. Northern Netherlands New Guinea . . . . . **annulitarse** (Heller)

3 (2) Aedeagus as figure 4; pronotum with a uniform clothing of short, pointed, whitish hairs and usually without large white scales; posterior angles of the pronotum square or slightly acute (fig. 1); setae on the frons whitish; length 25–33 mm. Northern Netherlands New Guinea . . . . . **cyclops** sp. n.

Aedeagus as figure 3; pronotum with a few large, white scales on each side of the middle, contrasting with the general clothing of short, pointed, yellowish-white hairs; posterior angles of the pronotum obtuse (fig. 2); setae on frons bright yellow (in the type); length *c.* 28 mm. Northern Netherlands New Guinea **papuanum** (Brenske)

4 (1) Frons bearing relatively long, stout, semi-erect yellowish-white or yellow setae; second, third and fourth visible abdominal sternites fairly densely clothed with white scales at the sides and almost bare in the middle 5

Frons bearing short, sharply-pointed triangular hairs, without contrasting, long, stout, semi-erect setae; scales on abdominal ventrites fairly uniformly distributed except for a small, dense patch of scales at the middle of each ventrite; aedeagus as figures 5, 12; length 30–36 mm. Duke of York I., near Rabaul, New Britain . . . . . **uniforme** (Fairmaire)

5 (4) Anterior margin of the pronotum without stout, semi-erect, yellowish setae; whole of upper surface of the pronotum with a general clothing of short, recumbent, triangular scales, without large bare areas and without a concentration of scale-bearing punctures along the median longitudinal line; elytra similarly

clothed except for two rather vague, bare, diagonal areas on each elytron in the apical half; length *c.* 30 mm. Northern New Guinea, Astrolabe Bay . . . . . **undatum** (Brenske)

Anterior margin of the pronotum with a few stout, semi-erect, yellowish setae similar to those on the frons; pronotum bare or with bare areas, or with a concentration of scale-bearing punctures along the median longitudinal line; elytra bare, or with patches of scales, or almost completely clothed with scales 6

6 (5) Elytra rather densely clothed with very narrow, pointed, dull yellowish scales, the scales on the elytra only half as wide as the paler, shining scales on the metepisterna; pronotum clothed like the elytra but with a concentration of scale-bearing punctures along the median longitudinal line which is faintly visible to the naked eye; aedeagus as figures 6, 13; length 25–30 mm. Northern district of Papua; Trobriand Is. . . . . **noxium** sp. n.

Elytra almost bare, or sparsely, or irregularly and densely clothed with broad, whitish scales, which are at least as wide as those on the metepisterna; pronotum usually with few scales on the disc and usually without a concentration of scales along the median longitudinal line 7

7 (6) Elytra bare, or with widely scattered single scales or very small setae; without patches of scales visible to the naked eye; puncturation of the elytra less dense, i.e. less than 60 punctures per sq. mm. on the disc 8

Elytra with at least one patch of scales visible to the naked eye; puncturation of the elytra dense, i.e. *c.* 100 per sq. mm. on the disc 9

8 (7) Elytra usually black; density of punctures on the disc of the elytra *c.* 50 per sq. mm.; aedeagus as figures 7, 14; length 25–30 mm. Papua, Yule I. . . . . **nigrum** (Nonfried)

Elytra reddish-brown; density of punctures on the disc of the elytra *c.* 10 per sq. mm.; aedeagus as figures 8, 15; length 28–31 mm. Cornwallis I., Murray I., Banks I. (Torres Str.) **lixi** (Nonfried)

9 (7) Pronotum in the anterior half with a smooth and relatively unpunctured area extending from about the middle almost to the lateral edge on each side; pronotum almost completely free of scales; elytra usually with two transverse bands of white scales on the apical half, but the area covered with scales may vary from a single minute patch to more than half the area of the elytra; aedeagus as figures 9, 16; length 25–30 mm. Larat I., Aru I., Banda I. . . . . **pica** (Arrow)

Pronotum rather densely punctured, the unpunctured areas small, never extending more than one-tenth of the distance from the middle of the pronotum to the lateral edge; pronotum always bearing white scales, sometimes densely clothed with scales, especially on the lateral margins; elytra largely covered with white scales and usually with one or more dark oblique, unscaled bands on the posterior half on each side 10

10 (9) Aedeagus as figures 10, 17; ground colour of body black; pronotum with scales dense only on the lateral margins; length 25–27 mm. Northern New Guinea and Goodenough I. . . . . **meeki** sp. n.

Aedeagus as figures 11, 18 ; ground colour of body reddish-brown ; pronotum with scales often dense on the disc as well as on the lateral margins ; length 27–33 mm. Northern Queensland, Papua, Cornwallis I., Lizard I., Aru I. . **albohirtum** (Waterhouse)

Dermolepida annulitarse (Heller).

Lepidoderma annulitarse Heller, 1914, *Nova Guinea* **9** : 637.

Length.—26–35 mm.

Surface of body dark brown ; head, pronotum and elytra fairly uniformly clothed with very narrow, sharply-pointed whitish scales, without contrasting larger white scales on head and pronotum ; frons, between the eyes, with a number of long, stout, backwardly-curved, yellow setae ; setae on the ocular canthus stout, yellow ; anterior margin of the pronotum with a few erect, stout, yellow setae near the middle ; elytra with long setae like those on the frons scattered singly on the disc and with a sparse fringe of long, stout, yellow setae on the lateral margins ; pygidium and ventral surface of abdomen fairly uniformly clothed with short, semi-erect, yellowish-white setae ; posterior coxae and ventral parts of the thorax clothed with long, fine, whitish hairs ; legs very dark brown or black, except the tibiae which are yellowish-brown, banded with black at the apex of each segment ; spines on the legs bright yellowish-brown.

Localities.—Netherlands New Guinea : Lorentz River (= Noord R.), ix.1909 ; Alkmaar, 18.ix.07 (types) ; Utakwa River Expedition, ix.1912–iii.1913 (*A. F. R. Wollaston*), 1 ♀ in the British Museum (Nat. Hist.).

Types in the Zoological Museum, Amsterdam.

Dermolepida cyclops sp. n. (Figs. 1, 4).

Length.—25–33 mm.

Dorsal surface dark reddish-brown or dark brown, ventral surface dark brown ; head, pronotum and elytra fairly uniformly clothed with very narrow, sharply-pointed, yellowish-white scales ; frons with scattered, large, white scales in addition, but without long, stout, erect setae ; anterior edge of the pronotum, except in the middle, bearing some short, erect setae, similar to those on the lateral edges ; surface of the pronotum without large, white scales ; posterior edge of the pronotum more strongly curved near the angles than in *D. papuanum* (figs. 1, 2) ; elytra with large, pointed, white scales scattered singly over the surface ; pygidium uniformly clothed with very short, yellowish-white setae ; ventral surface of the abdomen uniformly clothed with very short, recumbent, yellowish-white setae ; the penultimate ventrite bears, in addition to the short setae, a number of very long, very fine setae ; ventral surface of the thorax and the posterior coxae clothed with long fine hairs, and without scales ; femora dark brown, tibiae reddish-brown and tarsi yellowish-brown ; the elytra show a single short, dark, transverse mark, where scales are absent, at about the middle of the posterior half, on each side.

The species is easily distinguished from all other species except *D. papuanum* by the uniform clothing of short yellowish-white, very narrow, scales, scattered large white scales on the frons and the elytra, abdominal ventrites with a uniform clothing of short setae, by the absence of long setae from the frons, the middle of the anterior edge of the pronotum and from the disc of the elytra. It is clearly distinguished from *D. papuanum* by the aedeagus. The external differences between the two species are slight and difficult to assess as only one specimen of the latter species is known.

Localities.—Netherlands New Guinea : Mt. Cyclops, 3500 ft., iii. 1936 (*Miss L. E. Cheesman*), holotype; 14 paratypes, Lake Sentani, Iffar, viii.1936 (*Miss L. E. Cheesman*); 2 paratypes, Humboldt Bay District, Bewani Mts., about 400 metres, iv–viii.1937 (*W. Stüber*); 1 paratype, Cyclops Mts., Sabron, 930 ft., i.iv.1936 (*Miss L. E. Cheesman*).

Holotype in the British Museum (Nat. Hist.); paratypes will be deposited in the collections of the Division of Entomology, C.S.I.R.O., Canberra, and of the Department of Agriculture, Stock and Fisheries, Port Moresby.

Dermolepida papuanum (Brenske). (Figs. 2, 3).

Lepidoderma papuana Brenske, *in* Heller, 1895, *Abh. zool.-anthrop-ethn. Mus., Dresden*, **5** (16) : 3.

Length .—*c.* 28 mm.

Very similar to *D. cyclops*, being clearly distinguished only by the aedeagus, the parameres, of which lack the flange on the outer side of the apex, which is present in all other known species. In general colour, to the naked eye, *D. papuanum* is more obviously yellow, *D. cyclops* being greyish. The type of *D. papuanum* has, on the disc of the pronotum, on each side, one large, broad, pointed scale, which is twice as long as, and much paler in colour than, the adjoining normal scales (which are so narrow as to be little more than short, stout, sharply pointed, flattened setae). There are, in addition, near the large whitish scale, a group of similar but smaller scales, which are about as long as the normal scales, but are broader and paler in colour. It is probable that the number of broad, pale scales on the pronotum is variable. The posterior angles of the pronotum are obtuse (fig. 2), and the posterior edge only slightly curved in distinction from most specimens of *D. cyclops* (fig. 1).

Locality.—Northern New Guinea : Astrolabe Bay, Bongu (type).

Type in the Staatliches Museum für Tierkunde, Dresden.

Dermolepida uniforme (Fairmaire). (Figs. 5, 12).

Rhopaea uniformis Fairmaire, 1879, *Naturaliste* **1** : 70.
Lepidoderma uniforme ((Fairmaire), Brenske, 1894, *Soc. ent.* **9** : 42.

Length.—30–36 mm.

Body colour reddish-brown; head, pronotum, elytra and pygidium rather uniformly clothed with narrow, finely-pointed, semi-erect, yellowish-white scales; these scales are *c.* 0·15 mm. long and 0·03 mm. wide; each elytron with a small area in the middle of the posterior half in which scales are sparse; scutellum with similar but slightly broader scales which are crowded and overlapping in the anterior angles; pygidium with a slight trace of a median longitudinal ridge; posterior coxae and the ventral surface of the thorax towards the sides clothed with whitish scales which are broader (*c.* 0·05 mm.) and less sharply pointed than those on the dorsal surface.

This species is closely related to *D. papuanum* and is distinguished by the presence of broad white scales on the ventral surface and their absence from the dorsal surface.

Localities.—Duke of York I. (between New Britain and New Ireland).

Lectotype ♂ and paratype ♀ in the British Museum (Nat. Hist.).

Dermolepida undatum (Brenske).

Lepidoderma undata Brenske, *in* Heller 1895, *Abh. zool.-anthrop.-ethn. Mus., Dresden* **5** (16) : 3.

Length.—*c.* 30 mm.

Head, pronotum, elytra and abdomen of dark brown ground colour, fairly uniformly clothed on dorsal surface with short, narrow, white, triangular scales; posterior, upper part of frons bearing some rather stout, semi-erect, yellow setae; pronotum without setae on the anterior margin and elytra without setae on the disc; elytra with two relatively bare, diagonal areas in the posterior half, appearing dark in contrast to the pale scales which otherwise clothe the elytra; metasternum clothed with moderately long, semi-erect, fine, whitish hairs except in the posterior, outer angles where there are a few adpressed white scales; mesepimeron, metepisternum and metepimeron on each side fairly densely clothed with adpressed white scales which are slightly larger than those on the elytra; metacoxae and sides of the ventrites clothed with similar scales; femora and tibiae dark reddish-brown; tibiae paler.

Locality.—Northern New Guinea: Astrolabe Bay, Bongu (type).
Type in the Staatliches Museum für Tierkunde, Dresden.

Dermolepida noxium sp. n. (Figs. 6, 13).

Length.—25–30 mm.

Colour of the dorsal surface very dark brown, the clothing of scales giving the body a greyish appearance to the naked eye; clypeus and frons rather sparsely clothed with very narrow, triangular, yellowish-white scales; frons with a dense, circular patch of scales on each side of the middle; the two patches of dense scales are visible to the naked eye; pronotum rather sparsely and irregularly clothed with similar scales which are denser in the mid-longitudinal line and towards the lateral margins; frons with a relatively small number (*c.* 50) of large punctures, distributed above each eye and across the base, each puncture bearing a long, stout, pointed, semi-erect, yellow seta; each lateral edge of the pronotum with about ten long yellow setae and the anterior margin with a small number of similar setae, mainly towards the sides; scutellum densely clothed with very narrow, whitish scales in the anterior angles and along the sides; the scales sparse on the disc; elytra fairly uniformly clothed with very narrow, whitish scales, with a tendency to develop three faint diagonal, darker bands where the scales are less dense; apical prominence of each elytron with an obvious tuft of semi-erect white or yellowish setae, visible to the naked eye; pygidium sparsely clothed with whitish scales; the first four abdominal ventrites each with a patch of broad, ovoid, white scales on each side, the patches on the fourth ventrite united by a band of similar scales along the posterior margin; areas of the ventrites free from scales bear sparse, recumbent, short, fine, white setae; fourth ventrite with a few very long, erect and very fine white setae, arising from large punctures; terminal (fifth visible) ventrite sparsely clothed with short, recumbent, fine white hairs and ovoid scales; posterior margin of the terminal ventrite and of the pygidium each with a sparse fringe of long, yellow setae; legs dark reddish-brown with tarsi paler than the tibiae, sparsely clothed with narrow white scales; metasternum with a uniform clothing of long, very fine, semi-erect, whitish setae and with a few broad, ovoid, white scales in the outer, posterior angles.

Localities.—Papua: Kokoda, 1200 ft., x.1933 (*Miss L. E. Cheesman*), holotype ♂ and one paratype ♂, in the British Museum (Nat. Hist.). Kokoda, 1300 ft., ix.1933, one paratype ♂ (*Miss L. E. Cheesman*); Owgarra, 3 ♂ paratypes (*A. S. Meek*); Northern District, Sangara Plantation, 11 ♂, 3 ♀ paratypes (*J. J. H. Szent-Ivany*), Dept. Agric. No. 767.

The larvae of this species are reported by Dr. Szent-Ivany to cause the death of 80 per cent. of cocoa seedlings at an age of one year. The larvae, together with those of a parasite, were first discovered by Mr. van den Berk. The parasite has been identified by Dr. Szent-Ivany as *Campsomeris* sp. (Diptera: Scoliidae).

Dermolepida nigrum (Nonfried). (Figs. 7, 14).

Lepidoderma nigra Nonfried, 1894, *Ent. Nachr.* **20** : 9.

Length.—25–30 mm.

Body all black, or rarely with the elytra very dark reddish-brown ; head, pronotum, scutellum, elytra and pygidium with very sparse, small, pointed, white scales ; the scales most numerous near the lateral and posterior edges of the pronotum, the anterior margin of the elytra and in the anterior angles of the scutellum where they form a whitish spot visible to the naked eye ; otherwise the dorsal surface appears bare and shining ; frons with numerous long, stout, backwardly-curved, yellow setae ; anterior margin of the pronotum with a few similar, but shorter setae ; pronotal hypomera with a few white scales and some short, fine, semi-erect, whitish setae ; mesepimera, metepisterna and metepimera densely clothed with short, broad, adpressed, white scales which also spread into the postero-lateral angle of the metasternum ; remainder of the metasternum clothed with long, fine whitish hairs ; metacoxae with sparse, broad, white scales.

Locality.—Papua : Yule I., 19.x.33, 8 ♂, 3 ♀, (*R. V. Oldham*). In the British Museum (Nat. Hist.). Epo, Mekeo, xi.55, " a pest of banana," 4 ♂, 1 ♀ (*F. Arndt*). In the British Museum (Nat. Hist.).

Dermolepida lixi (Nonfried). (Figs. 8, 15).

Lepidoderma lixi Nonfried, 1894 (Jan.), *Ent. Nachr.* **20** : 10 ; Brenske, 1894, *Soc. ent.* **9** : 42. *Lepidoderma glaber* Brenske, 1894 (June), *Soc. ent.* **8** : 42 (**syn. nov.**).

Length.—28–31 mm.

D. lixi is closely allied to *D. nigrum* but is distinguishable by the bright reddish-brown colour of the elytra and the sparser, finer punctures and scales on the disc of the pronotum and elytra, so that the surface is more shining ; head, pronotum, ventral surface and legs black or dark reddish-brown ; the aedeagus is not distinguishable from that in *D. nigrum*.

Localities.—Papua : Port Moresby, 1 ♀. In the British Museum (Nat. Hist.). Cornwallis I. (type locality). Murray I. (144° E., 10° S.), 1 ♂ 1 ♀ (in the British Museum (Nat. Hist.)) ; Queensland, 1 ♂ (in the South Australian Museum).

Dermolepida pica (Arrow). (Figs. 9, 16).

Lepidoderma pica Arrow, 1916, *Ann. Mag. nat. Hist.* **18** : 496.

Length.—25–30 mm.

Body and legs usually all black, rarely with elytra dark reddish-brown ; frons bearing long orange-yellow setae, but with very few scales, or without scales ; pronotum with long orange-yellow setae on the anterior and lateral margins and with only a few white scales, in the postero-lateral angles ; posterior edge of the pronotum with a very sparse fringe of very short, white setae ; anterior half of the pronotum with a smooth, almost unpunctured area on each side, extending from near the middle to the lateral margin ; remainder of the surface of the pronotum fairly densely punctured ; elytra densely punctured on the disc except for two or three small smooth, unpunctured areas ; elytra also with patches of white scales on the apical half, the patches often extending into the basal half, but sometimes reduced to a minute area on each elytron, scarcely visible to the naked eye.

Localities.—Larat I., 5 ♂, 2 ♀ ; Banda I., 3 ♂ ; Aru I., 4 ♂, 2 ♀. These specimens constitute the type series. In the British Museum (Nat. Hist).

Dermolepida meeki sp. n. (Figs. 10, 17).

Length.—25–27 mm.

Body colour black or dark reddish-brown ; frons and pronotum densely but irregularly punctured ; pronotum with a trace of an aggregation of punctures (sometimes bearing white scales) along the mid-longitudinal line ; rarely with white scales scattered on the disc but always with a dense clothing of white scales on the lateral margins ; the elytra with a dense but irregular clothing of white scales ; elytra usually with three dark, bare areas on the apical half on each side, in addition to a bare area on the shoulder ; scutellum bare or with white scales scattered on the disc, and with dense white scales in the anterior angles.

The species is readily identifiable by the distribution of scales on the pronotum and by the shape of the aedeagus.

Localities.—Goodenough I. (*c.* 150° E., 9½° S.) (*A. S. Meek*), holotype ♂ and 5 ♀ paratypes, in the British Museum (Nat. Hist.). New Guinea : Owgarra (*A. S. Meek*), 1 ♀ paratype, British Museum (Nat. Hist.).

Dermolepida albohirtum (Waterhouse). (Figs. 11, 18).

Lepidoderma albohirtum Waterhouse, 1875, *Trans. ent. Soc. Lond.* **1875** : 202 ; Brenske, 1894, *Soc. ent.* **9** : 42 ; Froggatt, 1902, *Agric. Gaz. N.S.W.* **13** : 64 (biology) ; Mungomery, 1949, *Qd. J. agric. Sci.* **6** (4) : 205–226 (biology and control).
Rhopaea aruense Lansberge, 1879, *Ann. Soc. ent. Belg.* **22** : CL (**syn. nov.**) ; Brenske, 1894, *Soc. ent.* **9** : 42.
Lepidoderma waterhousei Brenske, 1894, *Soc. ent.* **9** : 42 (**syn. nov.**).
Lepidoderma lansbergei Brenske, 1894, *Soc. ent.* **9** : 42) **syn. nov.**).

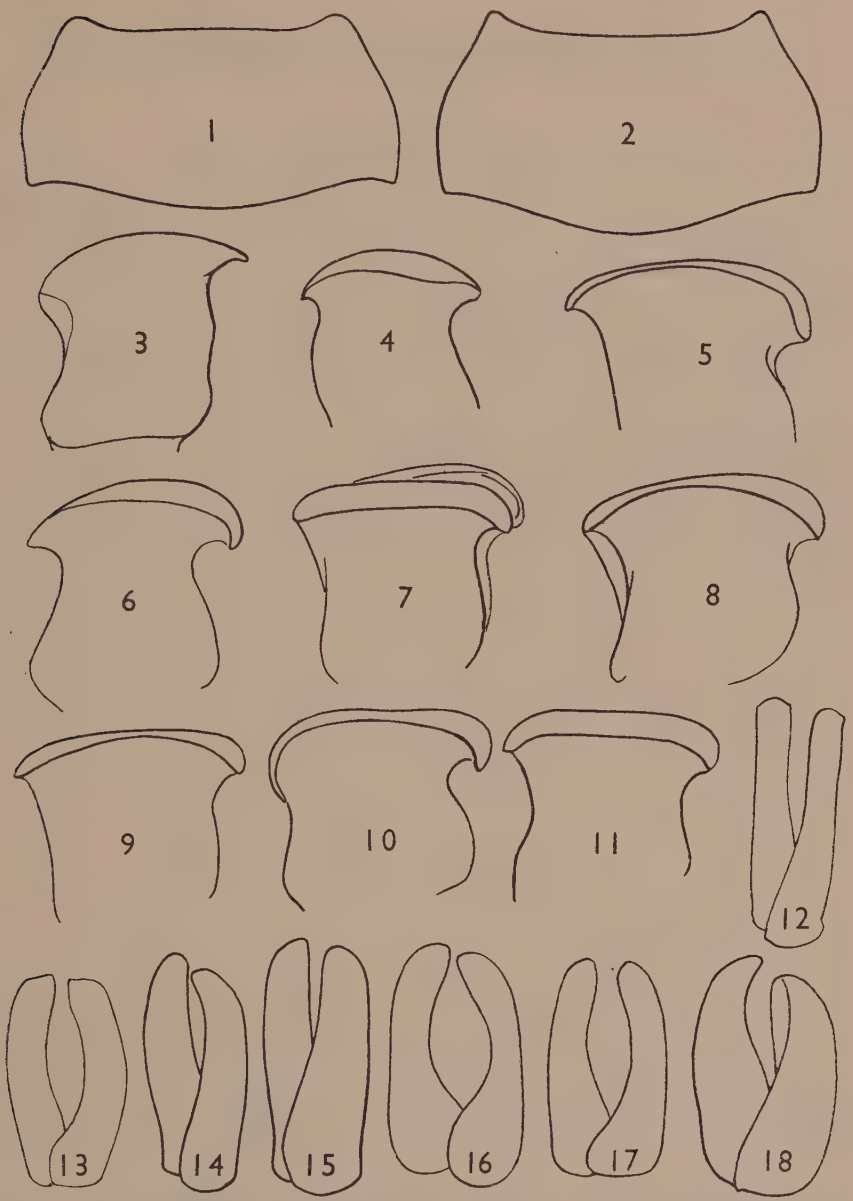
Length.—24–33 mm.

Head, pronotum, abdomen and legs black or dark reddish-brown ; elytra reddish-brown ; dorsal surface usually densely clothed with overlapping, broad, white scales, but the scales may be largely absent so that those remaining produce a mottled whitish effect on a reddish-brown ground colour ; each elytron often with two bare patches on the posterior half.

The species is closely related to *D. pica*, the aedeagi being very similar. *D. albohirtum* is distinguished by the relatively dense scaling of the pronotum, including a specially dense aggregation of scales in a slight median longitudinal groove in the anterior half.

D. albohirtum, in its larval stages, is a serious pest of sugar cane in some parts of northern Queensland. Adult beetles appear between October and January and feed upon the foliage of trees. Females return to the cane fields and re-enter the soil where they lay their eggs at a depth of between 9 and 18 in. Each female lays an average of 28 eggs. The larvae feed upon the roots of the cane with the result that the plant eventually falls under its own weight. Pupation occurs about September in an earthen cell at an average depth of 14 in. Emergence of the adults depends upon a rainfall sufficient to soften the soil.

Localities.—Queensland : Mt. Bellenden Ker (near Cairns). Papua : Port Moresby, 1 ♂, 4 ♀. NE. New Guinea : Garaina, 2500 ft. (Upper Waria River), xii.36–ii.37, 1 ♂, (*F. Shaw-Mayer*). Cornwallis I.: 2 ♂. Lizard I.: 3 ♂. Aru I.: 1 ♂, 2 ♀. All in British Museum (Nat. Hist.).



FIGS. 1–2.—Outline of pronotum : (1) *Dermolepida cyclops* sp. n., (2) *D. papuanum* (Brenske).

FIGS. 3–11.—Lateral view of apex of aedeagus : (3) *D. papuanum* (Brenske), (4) *D. cyclops* sp. n., (5) *D. uniforme* (Fairmaire), (6) *D. noxium* sp. n., (7) *D. nigrum* (Nonfried), (8) *D. lixi* (Nonfried), (9) *D. pica* (Arrow), (10) *D. meeki* sp. n., (11) *D. albohirtum* (Waterhouse).

FIGS. 12–18.—End view of aedeagus : (12) *D. uniforme* (Fairmaire), (13) *D. noxium* sp. n., (14) *D. nigrum* (Nonfried), (15) *D. lixi* (Nonfried), (16) *D. pica* (Arrow), (17) *D. meeki* sp. n., (18) *D. albohirtum* (Waterhouse).

SOME NEW SYRPHIDAE (DIPTERA) FROM YUGOSLAVIA.

By R. L. Coe.

(*British Museum (Natural History)*.)

The material described in this paper is in the collections of the British Museum (Natural History).

Myolepta nigritarsis sp. n.

♂♀.—General characters conforming to the generic diagnosis. Superficially resembling in shape and coloration of tergites the two British representatives of the genus, *luteola* Gmelin and *potens* Harris. The completely black legs readily distinguish it from all described European species.

Male.—Length, exclusive of antennae, 11 mm.; wing-length, 9·5 mm. Frons about as projecting as central prominence, dense grey dusting confined to a triangular patch on upper part against eyes, extending narrowly downward at sides to connect with grey dusting of face, otherwise the shining black ground-colour is exposed as a roundish patch over most of frons. Vertex, frons and eye-margins with sparse whitish hairs. Face with central prominence as evenly and equally rounded above as below; upper mouth-edge straight, not projecting; dusting of face dense, greyish, the shining black ground-colour only exposed on central prominence and from there downwards, more or less narrowly, to upper mouth-edge. Antennae with first two segments brownish-black, third clear yellow (larger than in *potens* male); arista rather long, reddish-brown. Mesonotum shining black, finely punctate anteriorly, coarsely posteriorly, clothed with a mixture of short brown and black hairs. Abdomen mainly yellow above and below; tergite 1 greyish except at sides; 2 with a median black marking, broad at base, narrowing almost to reach posterior margin; 3 with median black marking, equally broad for about basal two-thirds, then broadening to cover one-third or less of width of dorsal surface; 4 black, very coarsely punctate, moderately shining; tergites clothed on disc with short adpressed mainly golden hairs, at sides with whitish hairs, short except towards base of tergite 2; sternite 1 dull grey except towards posterior margin, 2 and 3 yellow, 4 dull grey. Pregenital segment shining black, white-haired. Legs completely black, clothed with short whitish and golden hairs, the front and hind tarsi having conspicuous short golden hairs ventrally; hind femora considerably swollen, with usual rows of short black spines beneath. Wings with greyish membrane; stigma light brownish, a brown cloud extending down from base of stigma to level of the vena spuria, which is infuscated for its apical half; veins on basal half of wing mainly clear yellowish-orange. Squamae whitish with whitish hair-fringe. Halteres pale yellow.

Female.—Length, exclusive of antennae, 10·5 mm.; wing-length, 9 mm. Face concave from base of antennae to upper mouth-edge, deeply so on upper half, shining black except for broad grey dusting extending across face below antennae and more narrowly down sides to mouth-edge. Frons shining black, projecting about as in male, with median groove extending down from front ocellus for more than half distance to frontal lunule, a pair of small grey dust-spots against eyes. Hairs on vertex, frons and face as in male. Antennae and arista as in male, but segment 3 of former larger. Mesonotum black as in male, but less shining, and coarse punctation more extensive. Abdomen more extensively darkened than in male; tergite 1 greyish except at sides; 2 with about middle third black, remainder yellowish-orange; 3 and 4 black, very coarsely punctate, moderately shining; tergites with hairs as in male. Sternite 1 dull grey except towards posterior margin, 2 yellow, 3 and 4 dull grey. Legs as in male, but hind femora only moderately swollen. Wings as in male, but more extensively infuscated and stigma darker brown. Squamae and halteres as in male.

Type ♂, allotype ♀ and 1 ♂ paratype, MACEDONIA : Prespa Geul, Oteševo, on flowers of Umbelliferae by lake, 9–21.vi.1955 (*R. L. Coe*).

Eumerus claripennis sp. n.

Superficially resembles *strigatus* Fallén, from which, amongst other characters, the narrower frons, less swollen hind femora and tibiae, and shorter general pubescence, distinguish it.

Length, exclusive of antennae, 6 mm.; wing-length, 4·5 mm. Eyes apparently bare. Frons narrow, parallel-sided, shining greenish-black, but a narrow strip of whitish dusting behind and in front of ocellar triangle, mainly whitish haired, black haired on triangle. Ocellar triangle narrow, approximately equal in length to contiguity of eyes. Face completely and densely silvery-dusted, with rather short whitish hairs. Antennae with first segment darkened, second partly reddish, third small and narrow, more than twice as long as second, parallel-sided, blunt-ended, darkened above and at tip, otherwise reddish. Arista reddish at the thickened base, otherwise slim, blackish. Mesonotum shining greenish-black, pubescence short, pale ; two broad grey stripes extending over anterior half of mesonotum, spreading at anterior extremity across to humeri, and at posterior extremity to notopleural suture. Scutellum greenish-black, shining, with short pale hairs. Tergites shining greenish-black, with short pale hairs ; 2–4 with rather narrow whitish side-stripes, those on 2 slightly concave, those on 3 and 4 convex. Sternites 1–3 dull grey. Pregenital segment small, shining black, with short pale hairs. Legs simple ; femora greenish-black, front and mid pairs narrowly yellow-tipped, hind pair only moderately thickened, with two rows of posteriorly directed, rather long spines on about the apical half ; front and mid tibiae yellow on basal half, hind pair yellow on basal third only ; front and mid tarsi entirely yellow, hind pair yellow below, obscured above, metatarsi more so. Hairs on legs short and whitish, those on hind tibiae and tarsi noticeably dense. Wings pellucid, stigma light brown. Squamae whitish, white-fringed. Halteres pale yellow.

Type ♂, MACEDONIA : Lake Ochrid, on hill scrub c. 500 ft. above lake, 4.vi.1955 (*R. L. Coe*).

Eumerus basalis Loew.

Eumerus basalis, Loew, H., 1848, *Stettin. ent. Z.* **9** : 126.

In 1848 H. Loew described, from the Island of Rhodes in the Aegean Sea, the male of *Eumerus basalis*. The female has hitherto remained unknown. In May 1955 I captured on the Island of Korcula, situated in the Adriatic Sea off the Dalmatian mainland, a pair of *Eumerus* with one sweep of the net. The male specimen agrees exactly with Loew's description of *basalis*, which is distinguished from the allied *pulchellus* Loew by, among other characters, its large hypopygium. I am satisfied that the female belongs to the same species. Korčula is a waterless island, the material being taken on a typical shrub-covered hill above olive plantations.

The *female* may be recognised by the following characters :—

Length, exclusive of antennae, 6 mm.; wing-length 5 mm. Eyes clothed with very short, sparsely scattered whitish hairs. Frons parallel-sided, occupying about one-quarter the width of head at level of front ocellus, shortly after which it gradually widens, until at level of base of antennae it is almost as wide as face ; it is shining black, rather finely punctate with a pair of very small whitish dust-spots against eyes just behind frontal triangle and very narrow strips of whitish dusting against eyes from just below level of front ocellus. Occiput concave and recessed for lower two-thirds of eyes, on upper third

swollen and with purplish reflections, its junction with the backwardly-extended shining black vertex very clearly defined; vertex clothed with stiff rather long black hairs. Face with the blackish ground-colour distinctly shining through the thin whitish dusting, clothed with scattered pale short hairs. Antennae with segments 1 and 2 very short, blackish; 3 large, roughly oval in shape, blackish above and at tip, otherwise reddish-orange; arista about as long as third antennal segment, slightly thickened and reddish at extreme base, otherwise thread-like and blackish. Mesonotum shagreened, with purplish and gold reflections; viewed from behind three short white median stripes are apparent, reaching from anterior margin down to transverse suture, the median line thread-like throughout, the other two broadening anteriorly and to a lesser degree posteriorly. Scutellum shagreened, purplish from above, the strongly compressed posterior margin appearing golden from the same viewpoint; hairs on mesonotum and scutellum pale, adpressed, extremely short. Tergites densely punctate, moderately shining black, whole of tergite 1, 2 except posteriorly on disc, and remainder of tergites towards sides, with golden reflections; tergites 2 and 3 with a pair of oblique, grey side-stripes, those on 2 very brief, on 3 twice as long and slightly concave; hairs on tergites mainly black and very short on disc, whitish and adpressed on grey side-stripes and laterally. Legs simple. Hind femora considerably swollen, hind tibiae and metatarsi proportionately so; femora shining black, narrowly yellow-tipped, hind pair with two rows of very short spines, antero-ventral and postero-ventral, for more than basal half; four anterior tibiae yellowish-orange for about basal half, otherwise black, posterior pair with the yellowish-orange slightly more restricted; four anterior tarsi completely yellowish-orange, posterior pair dull greyish-black above, segments 1–4 yellowish-orange at articulations, 5 completely so. Wings slightly grey-tinged, stigma and veins towards base of wing light yellowish-brown. Squamae whitish, white-fringed, halteres whitish.

Xanthogramma pedissequum Harris, var. **flavipleura** var. n.

Musca pedissequus Harris, 1776, *An Exposition of English Insects*: 61.

Typical examples in both sexes of *pedissequum* have the pleurae black, apart from a broad vertical yellow stripe occupying more than the posterior half of the mesopleura. Occasionally specimens occur with vague pale markings on the propleura, sternopleura or the metapleura, or on more than one of these. The very distinct variety here named as *flavipleura* has clear yellow markings on all the pleural parts mentioned.

Type ♂, Croatia: Plitvice, in old forest, 5.vi.1955 (*R. L. Coe.*)

SOME NEW AUSTRALIAN EPHEMEROPTERA.

By Janet E. Harker.

(*Department of Zoology, University of Cambridge.*)

PART I.

1. Introduction.

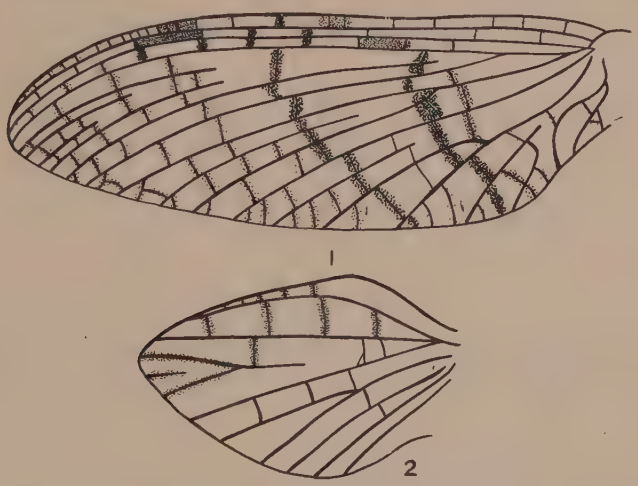
In the present paper the method of description follows that of previous papers (Harker 1950, 1954). Body length has been measured from the anterior edge of the clypeus to the base of the caudal filaments. Measurements of nymphs have all been made on the penultimate instar animals. Specimens have been collected by the author unless otherwise stated.

The types will be deposited in the British Museum (Natural History).

2. Leptophlebiidae.

Atalophlebia yugana sp. n.

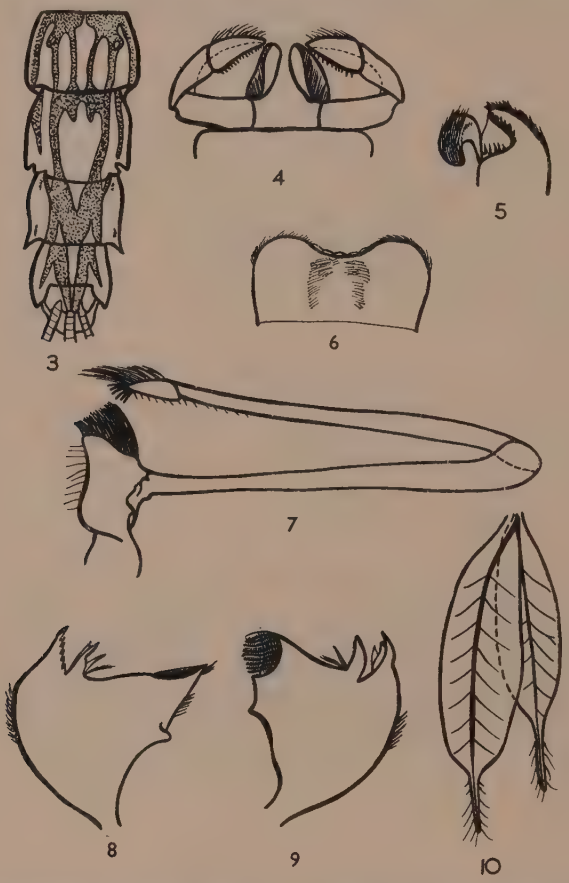
Female subimago—Measurements : Fore wing 14 mm. Hind wing 3·2 mm. Body length 14 mm. *General colour :* Creamy-yellow with very distinct dark brown markings. *Wings :* Veins dull brown, all cross-veins shaded with greyish-brown. Costal and subcostal areas of fore wing distinctly yellow. In the fore wing (fig. 1) *Rs* forks close to the base, and the long



Figs. 1–2.—*Atalophlebia yugana* sp. n. Subimago : (1) Fore wing. (2) Hind wing.

intercalary IR_{3b} arises close to the fork. *MA* arises at about the same level as IR_{3b}. *IMA* long, running almost to fork of *MA*. *MP* arises slightly basad to fork of *MA* and slants sharply towards *CuA* at its origin, but curves away as it runs towards the wing margin. Marginal two-thirds of *CuP* very strongly curved. Hind wing (fig. 2) : costal space long and very narrow at the apical end, a number of cross-veins present. *Rs* arises just beyond half the distance from base to apex. Fork of *MP* slightly basad to origin of *Rs*. No inter-

calary present in *MP*. *Legs :* Yellow with one faint stripe near proximal end of femur and two very dark stripes at distal end ; one stripe present at distal end of tibia, and distal end of each segment of the tarsus is slightly shaded. Legs very long and noticeable with their distinct markings. Fore leg : femur 2·4 mm., tibia 4·0 mm., tarsus 2·0 mm. Tarsal segments in order of decreasing length : 2, 3, 5, 4, 1 (fused with tibia). Mid leg : femur 4 mm., tibia 4·5 mm., tarsus 1·5 mm. Hind leg : femur 4·0 mm., tibia 4·5 mm., tarsus



Figs. 3–10.—*Atalophlebia yugana* sp. n. Nymph : (3) Abdomen. (4) Labium. (5) Glossa and paraglossa. (6) Labrum. (7) Maxilla. (8) Right mandible. (9) Left mandible. (10) Gill.

1·0 mm. Tarsal segments in order of decreasing length : 2, 5, 3, 4, 1 (fused with tibia). Tarsal claws all acute. *Abdomen :* With very clear dark brown markings, segments 10 and 7 noticeably lighter in colour. Lateral angles of segment 9 produced into short spines. Subanal plate deeply concave. Appendix dorsalis present, shorter than caudal filaments, all three distinctly striped with brown.

Nymph.—Measurements : Body length 14 mm. *General colour :* Yellow with very distinct brown to black markings (fig. 3). *Head :* Very nearly square in outline. Antennae very long (9 mm.). Eyes widely separated in male nymph in the last instars, but clearly divided into a black lower and a brown upper portion. *Mouth parts* unusual, particularly the maxillae, which (fig. 7) bear long palps projecting well anterior to the head even when the

joints are bent at rest. (At first sight these palps look not unlike an extra pair of legs, and when the nymph is feeding they are stretched out over the the detritus on the stream bed and sweep particles into the mouth.) In a nymph with the head 2·2 mm. long, length of maxillary palp is 10 mm., the proximal two segments being equal in length and the distal one very small. Mandibles (figs. 8–9) well developed and each bears two groups of canines and a well-developed molar process. Labrum (fig. 6) deeply concave on its anterior edge and bears six denticular plates. Labium (fig. 4) with a 3-segmented palp, the distal segment narrowing considerably at the tip and bearing spines and hairs. Paraglossae large, and on inner border completely recurved so that the thick brush of hairs lies adjacent to the thick hairs on the small overlying glossae. (In fig. 5 the paraglossa has been separated from the glossa to show the inner border of the former. The tips of the maxillary palps are drawn through the brushes on the labium when the nymph is feeding.) *Legs :* Very long (hind leg 8·4 mm.) ; held under the body so that the nymph stands well up from the bed of the stream. Tibia and femur of all legs about equal in length, being three times the length of the tarsi. Tarsal claws quite smooth. Legs yellow in colour with three dark stripes on femur, two on tibia and one on tarsus. *Gills* (fig. 10) : Very long (second gill 6 mm.), held nearly vertical above the body in life ; they are double, broadly lanceolate, with a drawn-out tip, and are present on segments 1–7. *Abdomen :* Lateral angles of abdomen produced into spines (fig. 3). Caudal filaments spread wide apart and held well out from the body. Appendix dorsalis well developed and as long as caudal filaments. Dark brown annulations on all three.

Male imago, female imago.—Unknown.

Holotype female subimago, New South Wales : Kuringae Chase, Sydney, viii.1955. In alcohol. Morphotype nymph and paratypes, same locality.

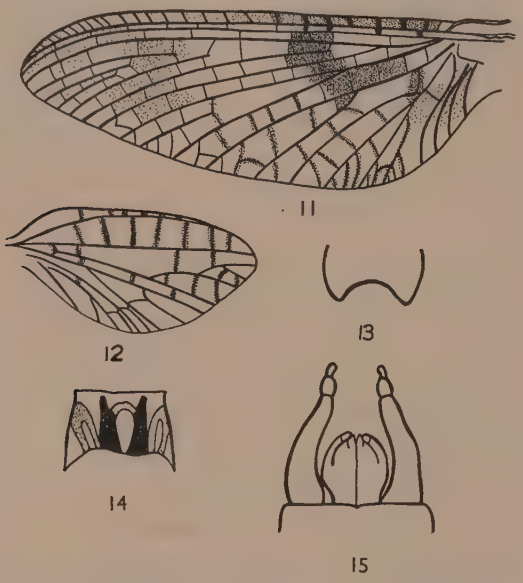
This species is quite distinct and easily separated from any other known Australian species. In the key to this genus (Harker, 1954) it runs to section 7 and can be separated from the following species by the extreme length of the legs. The nymph is immediately distinguishable from those of other species by the elongated maxillary palp.

Atalophlebia darrunga sp. n.

Male subimago.—Measurements : Body length 11 mm. Fore wing 11 mm. Hind wing 3 mm. *General colour :* Reddish-brown with dark brown markings. Upper region of eyes bright orange, the lower black. *Wings :* Veins red-brown, all the cross-veins suffused with smoky-grey, as is also the membrane in the regions shown in fig. 11. Cross veins in basal half of costal and subcostal areas very distinct. Fore wing : *Rs* forks close to base of wing, and the long intercalary IR_{3b} arises close to the fork. Fork of *MA* also arises in basal half of wing, very slightly basad to IR_{3b}. *IMA* short. MP_2 arises close to the base and slants sharply towards *CuA* at its origin, curving away again as it runs towards the wing margin. *CuP* distinctly sigmoid. Hind wing (fig. 12) : costal space long and very narrow with a number of cross-veins. *Rs* arises in apical half of wing. *MP* forked at slightly less than half the distance from base to apex, an intercalary present in the fork. *Legs :* Yellow-brown with two dark bands on femur and tibia. Tarsi all dark brown except for distal segment. Femur slightly shorter than tibia in mid and hind legs, and tarsus about half length of femur. In the fore leg the tibia and femur equal in length, and shorter than tarsus. Tarsal segments in order of decreasing length : fore leg 2, 3, 4, 5, 1 (fused with tibia), hind leg 5, 2, 3, 4, 1 (fused with tibia). Tarsal claws all acute. *Abdomen :* Light reddish-brown with a distinctive dark brown pattern (fig. 14) of which the clearest feature is a row of two almost parallel lines in the mid-dorsal region. Appendix dorsalis present, slightly shorter than caudal filaments. *Genitalia* (fig. 15) : Not unlike *A. albiterminata* in general shape. Incision between the two halves of penis much deeper. Two processes

present on the median line, but these differ in shape from the heart-shaped processes in *A. albiterminata*. Penis reaches well beyond the narrowing of the first segment of forceps.

Female imago.—Measurements : Fore wing 14 mm. Hind wing 4 mm. *General colour :* Dark brown with black markings. *Wings :* Veins dark brown, cross-veins in costal and subcostal areas very dark and thick. One black spot over the bulla in the subcostal area. Pterostigmal area shaded brown. *Legs :* Fore leg femur slightly shorter than tibia ; in the hind legs femur and tibia equal in length. Tarsus slightly more than half length of tibia. Tarsal segments in order of decreasing length : 5, 1 (fused with tibia), 2 = 3 = 4. Tarsal claws all acute. *Abdomen :* Subanal plate with a deep incision (fig. 13). Appendix dorsalis present, slightly shorter than caudal filaments, and much thinner ; all three clearly annulated with dark brown.



Figs. 11–15.—*Atalophlebia darrunga* sp. n. Subimago : (11) Fore wing. (12) Hind wing. (13) Subanal plate. (14) Abdominal pattern. (15) Genitalia.

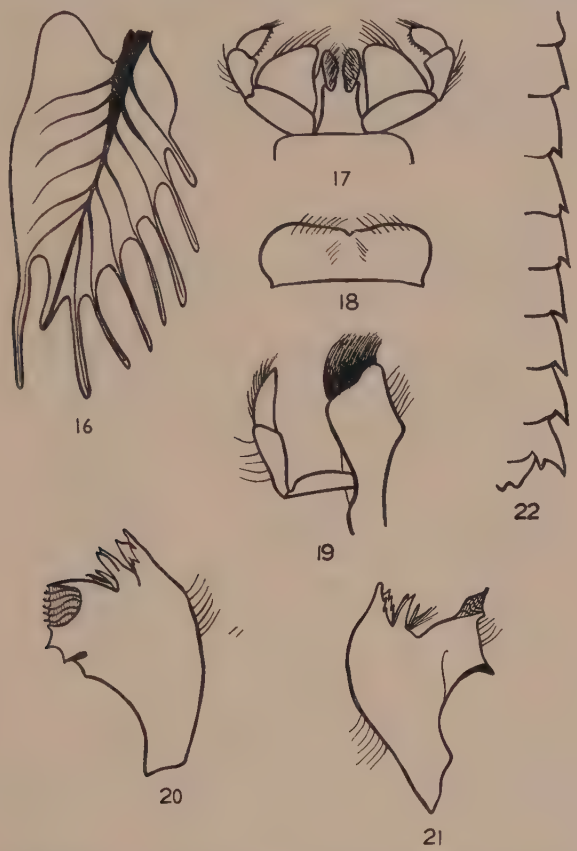
Female subimago.—Measurements : Fore wing 12 mm. Hind wing 3·2 mm. Otherwise as imago, and wings as male subimago.

Nymph.—Measurements : Body length 14 mm. *General colour :* Yellowish-brown with dark brown markings. *Head :* Antennae long. Eyes wide apart, even in the male. *Mouth parts* (figs. 17–21) : Like *A. albiterminata* in most details. Mandibles well developed with two groups of canines on each, but not divided into three teeth as in *A. albiterminata*, and with large molar processes. Maxillae with 3-segmented palp, the distal segment being the shortest and tapering to a point, the second segment slightly longer than the proximal one. Labium with a 3-segmented palp, the distal two segments being about equal in length and shorter than the proximal one. Shape of submentum differs from that of *A. albiterminata*. Anterior edge of labrum slightly concave and fairly smooth, the concavity much shallower than that of *A. albiterminata*. *Legs :* Of medium length (hind leg 5 mm.). Femur in all legs with three dark bands, tibia with two and tarsus with one. *Abdomen :* Lateral edges of abdominal segments prolonged into spines (fig. 12). Caudal filaments ringed with dark brown. *Gills* (fig. 16) : Double and multidigitate, but with the outer edge undivided in

the dorsal lamellae, the ventral one with two or three digits on the outer edge. Gills present on segments 1–7.

Holotype male subimago, New South Wales: Coal and Candle Cr., Sydney, 17.viii.1955. Allotypes and morphotype, same locality. Paratypes, N.S.W.: Epping, viii.1955; Armidale, viii.1955.

This species is close to *A. albiterminata*, but can be distinguished by a number of features. The wing pattern in the subimago is not as clearly defined in the



Figs. 16–22.—*Atalophlebia darrunga* sp. n. Nymph: (16) Gill. (17) Labium. (18) Labrum. (19) Maxilla. (20) Left mandible. (21) Right mandible. (22) Outline of abdominal angles.

posterior half of the wing, the fork of *MA* in the fore wing is basal to the beginning of IR_{3b} (not apical as in *A. albiterminata*), *MP* of the hind wing is forked, and the shape of the penis is different, as are the abdominal markings of the nymph, the form of the spines on the abdomen, and the mouth parts.

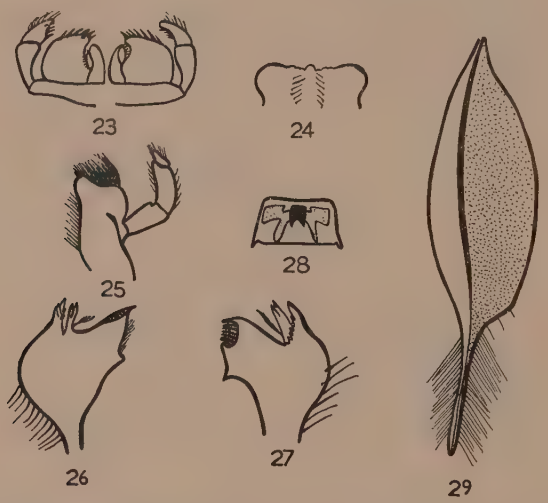
In the key to *Atalophlebia* (Harker, 1954) this species would come in section 13. It can be separated from *A. incerta* as follows:

Penis narrows at the base . . . . . **A. darrunga**
Penis narrows at two-thirds of distance from base to tip . . **A. incerta**

Atalophlebia pierda Harker.

The nymph of this species was previously unknown.

Nymph.—Measurements : Body length 9 mm. *General colour :* Yellow with pale brown markings. *Mouth parts* (figs. 23–27) : Mandibular canines well developed with many teeth. Maxilla with 3-segmented palp, the basal two segments broad and elongated slightly at the distal end of the inner surface, the distal segment very short and narrowing at its free end. Labium with well developed paraglossae slightly concave on the inner surface and bearing well developed spines on the anterior edge. Glossae small with numerous spines. Labial palp 3-segmented, basal segment long and fairly stout, the second segment broadening considerably at the distal end, the distal segment narrowing at its free end. Labium with



Figs. 23–29.—*Atalophlebia pierda* Harker. Nymph: (23) Labium. (24) Labrum. (25) Maxilla. (26) Right mandible. (27) Left mandible. (28) Abdominal pattern. (29) Gill.

a convex protuberance on its anterior margin. *Legs :* Hind leg considerably longer than other legs. Tarsus about one-quarter length of tibia, which is slightly shorter than femur. Tarsal claws short and heavily denticulate. *Abdomen :* Lateral edges of abdominal segments all with small backwardly projecting spines, that on segment 9 much longer than the others. Caudal filaments and appendix dorsalis equal in length. *Gills :* Seven pairs, all double (fig. 29), very long, each one being equal to about six abdominal segments. Each lamella broad with a long tip bearing many fine hairs.

Holotype, New South Wales : Kuringae Chase, Sydney, 27.viii.1955.

(*continued on p.* 69)

SOME NEW AUSTRALIAN EPHEMEROPTERA.

By Janet E. Harker.

(*Department of Zoology, University of Cambridge.*)

PART II.

A key to the nymphs of the genus *Atalophlebia* was not given in previous papers, and, although only eight of the nineteen described species are known in this stage, it is possible to separate them by the following key.

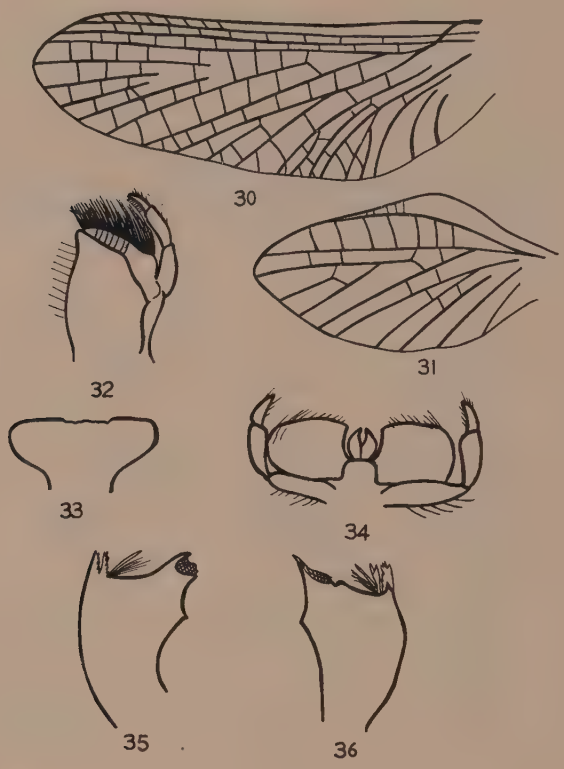
Key to Nymphs of the Genus *Atalophlebia*.

1. Gills double, lamellae undivided 2
   Gills double, lamellae divided into at least three digits 4
2. Lamellae of gills not more than twice as long as broad **A. longicaudata** Harker
   Lamellae of gills more than twice as long as broad 3
3. Distal end of lamellae drawn out into a short projection with few hairs. The plate of the lamellae ovate . . . . . **A. yugana** sp. n.
   Distal end of lamellae drawn out into a long projection with many hairs. The plate of the lamellae lanceolate . . . . . **A. pierda** Harker
4. Gill lamellae trifurcate 7
   Gill lamellae multifurcate 5
5. Gill feathery in appearance, forming a thick mat along the side of the body . . . . . **A. australasica** Pictet
   Not so 6
6. Outer margin of dorsal lamellae bearing at least three digits **A. albiterminata** Tillyard
   Outer margin of dorsal lamellae without digits . . . **A. darrunga** sp. n.
7. Apical filaments very fine, abundant tracheae in the lamellae **A. superba** Tillyard
   Rather stout apical filaments, few tracheae 8
8. Glossae very small and raised above paraglossae. Left mandible with an elongated molar area . . . . . **A. incerta** Harker
   Glossae not raised above paraglossae. Molar area of left mandible very broad . . . . . **A. maculosa** Harker

Atalonella darkara sp. n.

Female subimago.—Measurements: Body length 12 mm. Fore wing 6 mm. Hind wing 1·5 mm. *General colour:* Yellowish with dull brown markings. *Wings:* Uniform grey in colour. Fore wing (fig. 30): costal and subcostal area slightly milky. *Rs* forks close to base of wing, and the long intercalary IR_{3b} arises close to the fork. Fork of *MA* slightly apical to beginning of IR_{3b}. *IMA* short. MP_2 arises at about one-quarter of length from base to apex, and lies half way between MP_1 and *CuA*. *CuP* bends sharply down towards posterior edge of wing at level of MP_2. Hind wing (fig. 31): Costal space short, five cross-veins present. *Rs* arises in basal half of wing, *MP* forked at about one-third the distance from base to apex. *Legs:* Cream, no markings. Femur slightly shorter than

tibia, and tarsus about half length of femur. Tarsal segments in decreasing order of length : 5, 2, 3, 4, 1 (fused with tibia). Tarsal claws all acute. Appendix dorsalis present, but shorter than caudal filaments. Subanal plate with a very shallow concavity on its posterior margin.



Figs. 30–36.—*Atalonella darkara* sp. n. Subimago: (30) Fore wing. (31) Hind wing. Nymph: (32) Maxilla. (33) Labrum. (34) Labium. (35) Left mandible. (36) Right mandible.

Nymph.—Measurements : Body length 10 mm. *Mouth parts* (figs. 32–36) : Mandibles with small canines much denticulated, molar regions small. Maxillae with 3-segmented palp ; the proximal segment very slightly longer than the second, the distal segment small and pointed. Labium with 3-segmented palp, the basal segment longer than the second, the distal shorter and narrow at the tip. Glossae small and narrow at the tip ; paraglossae large, broader than long, slightly concave on the inner edge. Labium shallowly concave at the anterior margin, five rounded denticles present. *Legs :* Yellow without markings, but the dorsal side slightly darker. Femur of hind leg equal in length to tibia and tarsus. Tarsal claws short and denticulate. *Gills :* Seven pairs, all double and lanceolate. *Abdomen :* Clear brown pattern, the most noticeable feature being a median yellow circle on each segment. Lateral abdominal angles prolonged backwards in spines, the longest being on the ninth segment.

Male.—Unknown.

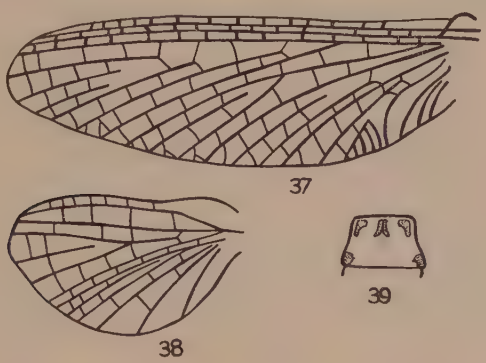
Holotype, Tasmania : Burnie, 6.xii.1954 (*B. McMillan*).

This species can be separated from the other known members of the genus by the colour of the subimaginal wings, the venation of the hind wings and the nymphal mouth parts.

Kirrara algona sp. n.

Female imago.—Measurements : Body length 6 mm. Fore wing 9 mm. Hind wing 2·3 mm. *General colour :* Light yellowish-brown. *Wings :* Clear without any markings. Veins golden-brown. First intercalary of *CuA* in fore wing (fig. 37) does not arise as close to wing base as in the other two described species of *Kirrara*, and second intercalary not connected to the first at its base. In hind wing (fig. 38) the radial sector arises close to origin of *MA*. Intercalary of *MP* runs nearly full length of fork. Costal area narrow and long, running nearly to apex of wing, and costal angulation very slight. *Legs :* Golden-brown without any markings. Legs very long relative to the body size ; in the hind leg the femur 2·7 mm., tibia 2·1 mm., tarsus 0·7 mm. Tarsal segments in decreasing order of length : 5, 2 = 3, 4, 1 (fused with tibia). Tarsal claws of each pair dissimilar. *Abdomen :* Clear golden-brown with three very distinct dark brown markings, one mid-dorsal, the other two lateral (fig. 39). The three last abdominal segments with chalky white bands on their posterior halves. Subanal plate very large, projecting well beyond last abdominal segment and slightly flattened at the tip. Cerci same colour as legs with very faint brown annulations. Appendix dorsalis well developed.

Male imago, subimago, nymph.—Unknown.



Figs. 37–39.—*Kirrara algona* sp. n. Imago : (37) Fore wing. (38) Hind wing. (39) Abdominal pattern.

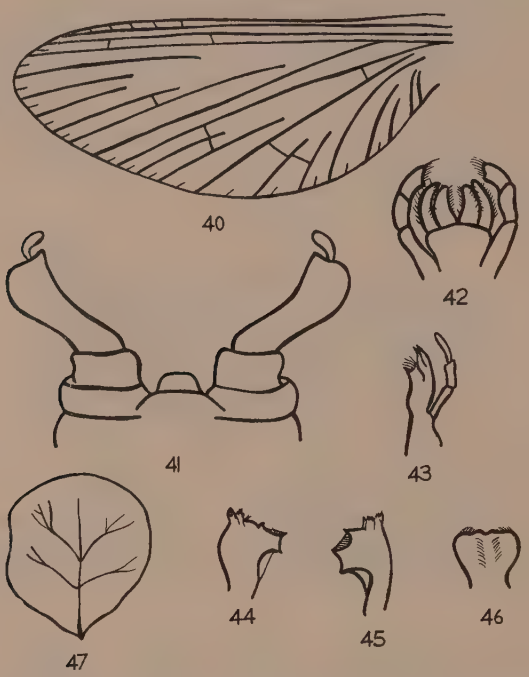
Holotype female imago, New South Wales : Tumut-Talbigo Road, 900–1200 ft., 24.xii.1947 (*B. McMillan*). Paratypes, N.S.W.: Willow Tree, near Armidale, 2000 ft., viii.1955. In alcohol.

This species can be separated from the other two known species by the lack of any colour on the wing membrane, the form of the subanal plate, and the proportions of the tarsal segments. It should be noted that in the original description of one of these species, *K. amenia* Harker, 1954, the tarsal claws are referred to in error as being all alike ; they are in fact dissimilar in each pair.

3. Baetidae.

Cloeon nandirum sp. n.

Male subimago.—Measurements : Body length 7 mm. Fore wing 4 mm. Hind wing absent. *General colour :* Cream with very pale brown markings. *Head :* Eyes turbinate, the dorsal section orange, the lower black ; very close together, so that the upper sections are almost contiguous. *Wings* (fig. 40) : Veins cream and not easily seen. Pterostigmal area milky, with five cross-veins. *Rs* branches close to wing base. Very few cross-veins, otherwise typical *Cloeon* venation. *Legs :* Cream without markings. Hind leg femur equal in length to tibia plus tarsus. Tarsal segments in decreasing order of length : 2, 3 = 5, 4, 1 (fused with tibia). *Abdomen :* First two segments dark brown, three and four cream, five and six dark brown, and the rest cream. Appendix dorsalis absent. *Genitalia* (fig. 41) : Forceps four-segmented, the basal two segments short and broad, the third long and wider distally, the distal segment very short.



Figs. 40–47.—*Cloeon nandirum* sp. n. Subimago : (40) Fore wing. (41) Genitalia. Nymph : (42) Labium. (43) Maxilla. (44) Right mandible. (45) Left mandible. (46) Labrum. (47) Gill.

Nymph.—Measurements : Body length 6 mm. *General colour :* Yellow with very pale brown markings. *Mouth parts* (figs. 42–46) : Mandibles with small molar region, canines with many teeth. Labrum concave on its anterior edge. Maxillae with a well-developed tooth in the galea region, the lacinia square in outline. Maxillary palp 3-segmented with the first and third segments about equal in length, the middle one shorter. Labium with well developed glossae and paraglossae of similar shape. Palp 3-segmented, the basal segment being longer than the other two, which are about equal in length. Distal segment

slightly concave on its free edge. *Legs :* Cream, without markings. Tarsal claw very long, tapering sharply at the tip, and heavily toothed. *Gills* (fig. 47) : Seven in number, all double except the most posterior. Nearly circular in outline.

Female.—Unknown.

Holotype male subimago, QUEENSLAND : Townsville, 28.ix.1948 (*B. McMillan*).

The genitalia and colour of the abdomen distinguish this species from *C. tasmaniae* which it otherwise resembles.

Bungona gen. n.

Imago.—Small mayflies. Eyes of the male large and turbinate, the lateral ocelli large. Posterior margin of female head nearly straight. Fore wing with venation similar to that of *Pseudocloeon*, marginal intercalaries double. Hind wing absent. Fore leg of male with femur and tarsus equal in length and twice as long as tibia. In both sexes tibia and tarsus of hind leg equal in length, being three-quarters length of femur. Tarsal claws of each pair dissimilar. Forceps of male four-segmented ; the two basal segments short and stout, third segment longer and bowed, distal segment narrow and short. Penis cover present. Penis broad.

Nymph.—Free swimming form. Maxillary palp 3-segmented, galea region longer than lacinia, the two being fairly clearly defined. Labium with narrow long glossae and paraglossae ; labial palp 3-segmented. Legs with long femur, about twice length of tibia and tarsus. Tarsal claws long and tapering. Gills single, seven pairs, all pointed with trachea on one-half of median line only. Appendix dorsalis slightly shorter than the caudal filaments.

Type species : *Bungona narilla* sp. n.

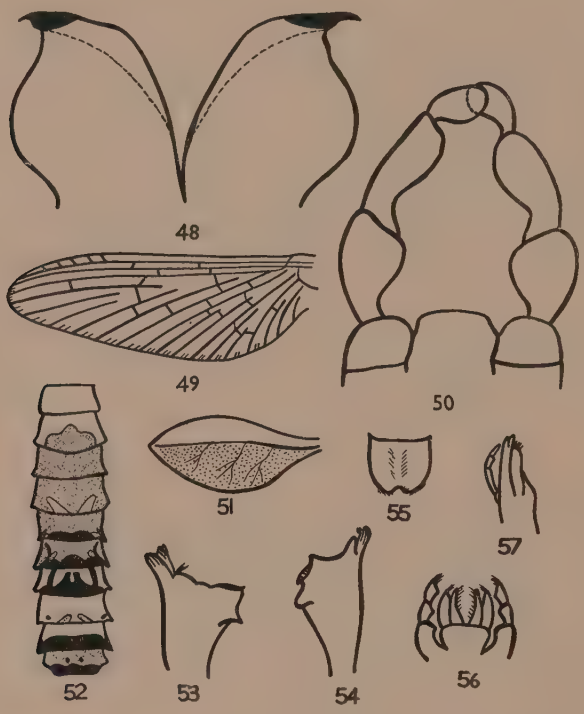
This genus is similar to *Pseudocloeon* in the absence of the hind wing, and the presence of paired marginal intercalaries in the fore wing. It differs from *Pseudocloeon*, however, in a number of characters : the relative lengths of the leg segments of the imago are unlike those of *Pseudocloeon*, and the forceps differ in shape and in the number of segments. In the nymph the maxillary palp is three-segmented, not two-segmented as in *Pseudocloeon*, and the shape of the labial palp is unlike that of the latter genus. The appendix dorsalis is present in *Bungona* and not in *Pseudocloeon*.

Bungona narilla sp. n.

Male imago.—Measurements : Body length 5 mm. Fore wing 4 mm. *General colour :* Dark brown head ; thorax, and tip of abdomen cream. *Head :* Eyes turbinate with dorsal halves standing up vertically and very close together, reddish-brown in colour ; ventral halves of eyes black and placed laterally on the head. Two large black ocelli at anterior base of eyes, the median ocellus black and small. *Wings :* Hyaline with almost colourless veins. Costal brace black. Fore wing (fig. 49) : Pterostigma with five cross-veins, *Rs* forking close to its origin, and the long intercalary IR_{3b} arising close to the fork. Branches of *MA* and *MP* separated from the main stem, but supported by cross-veins. Marginal veinlets double. Hind wing absent. *Legs :* Femur yellow, tibia and tarsus greyish-brown. Fore leg femur equal in length to tarsi, tibia half length of femur. Hind leg tibia and tarsus equal in length, being about three-quarters length of femur. Tarsal segments of hind lég in decreasing order of length : 2, 3, 5, 4, 1 (fused with tibia). Tarsal claws of each pair

dissimilar, one being acute and the other obtuse. *Abdomen :* First two abdominal segments light brown, segments 3–7 yellow, the posterior segments light brown. Appendix dorsalis absent. *Genitalia :* Forceps (fig. 50) 4-segmented ; the second segment broad and short, arched on its inner surface, third segment much longer and also arched, distal segment small. Penis with a sharp spine distally (fig. 48) ; penis cover present.

Female subimago.—Similar to male in most features. Eyes smaller than in the male and widely separated. Posterior margin of the head nearly straight. Hind leg of female of similar proportions to that of male. Subanal plate quite straight on its free margin.



Figs. 48–57.—*Bungona narilla* sp. n. Imago : (48) Penis. (49) Fore wing. (50) Forceps. Nymph : (51) Gill. (52) Abdomen. (53) Right mandible. (54) Left mandible. (55) Labrum. (56) Labium. (57) Maxilla.

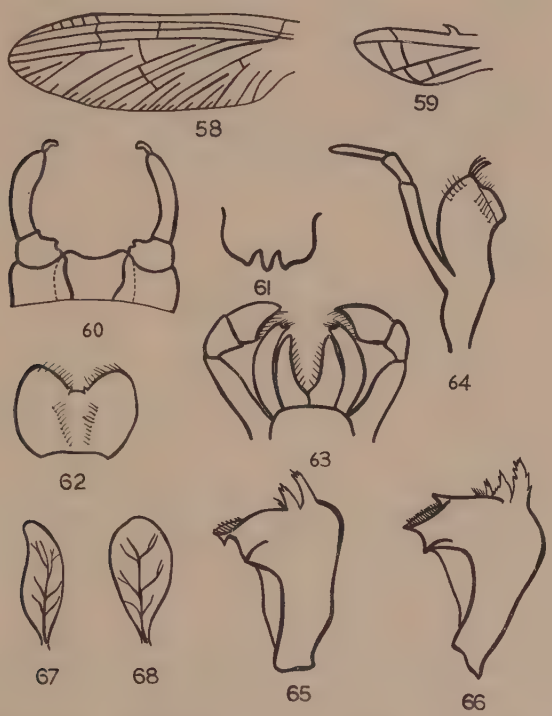
Nymph.—Measurements : Body length 5 mm. *General colour :* Yellow with clearly defined brown markings (fig. 52). *Head :* Antennae very short. *Mouth parts* (figs. 53–57) : Mandibles with blunt canines and small molar regions. Maxilla with 3-segmented palp, rather shorter than the galea-lacinia, the first segment being the longest. Galea region longer than the lacinia and toothed ; the lacinia blunt and slightly rounded at its tip. Labium with large glossae and paraglossae, the glossae slightly the longer. Palp 3-segmented, the basal segment stout, the middle segment produced inwards at its tip, and the distal segment truncate. Labium sharply concave on its anterior margin. *Legs :* Femur twice as long as tibia and tarsus, which are equal in length. Tarsal claws long and tapering acutely at tip. *Gills :* Seven pairs, all single and slightly pointed at tip (fig. 51).

Abdomen : With a clearly defined dark brown pattern (fig. 52). Appendix dorsalis slightly shorter than the caudal filaments. Hairs only on inner sides of caudal filaments.

Holotype male imago, New South Wales : Coal and Candle Cr., Sydney, 15.viii.1955. Morphotype female subimago and nymph same locality.

Centroptilum collendum sp. n.

Male subimago.—Measurements : Body length 10 mm. Fore wing 5 mm. *General colour :* Cream with dark brown markings. *Head :* Eyes turbinate, the upper region orange and the lower black, oval in shape. *Legs :* In hind leg the femur the longest segment (1·28 mm.), the tibia and tarsus being equal in length (1·0 mm.). Tarsus with four free segments, the first being fused with the tibia. Tarsal segments in decreasing order of length:



Figs. 58–68.—*Centroptilum collendum* sp. n. Subimago: (58) Fore wing. (59) Hind wing. (60) Male genitalia. (61) Female subanal plate. Nymph: (62) Labrum. (63) Labium. (64) Maxilla. (65) Right mandible. (66) Left mandible. (67) Second gill. (68) Third gill.

2, 5, 3, 4, 1. Fore leg as long as body. Tarsal claws unlike, one of each pair being acute and the other obtuse. *Wings :* Veins nearly transparent. Fore wing (fig. 58): Pterostigmal area milky and with five cross-veins. Marginal intercalaries single. Hind wing (fig. 59) with acute curved costal projection and three longitudinal veins. Cross-veins present. *Abdomen :* Appendix dorsalis absent. *Genitalia* (fig. 60): Forceps 4-segmented. Basal two segments

short and stout, the second with a projection on its inner surface, third segment long and curved, fourth very small and slightly broader at its dorsal tip. Penis cover present, slightly concave on the anterior border

Female subimago.—Similar to the male in most features. Posterior margin of head concave. Subanal plate with a median projection (fig. 61).

Nymph.—Measurements : Body length 9 mm. *General colour :* Cream with dark brown markings. *Mouth parts* (figs. 62–66) : Mandibles with slender canines and relatively small molar regions. Maxillary palps 3-segmented, the proximal segment being nearly as long as the galea-lacinia, the distal two much shorter, but the whole palp extending well beyond the tip of the maxillae. Labium with narrow glossae and paraglossae, the latter being the longer and concave distally. Palp 3-segmented, the proximal segment narrow and the next two broad and slightly shorter on the inner side. Labium V-shaped, with a deep concavity on its anterior edge. *Legs :* In hind leg femur slightly longer than tibia, which is itself longer than the tarsus without the claw. Tarsal claw slender and very long, being about equal in length to the tarsus itself, so that the tarsus and claw together are longer than the femur. *Gills :* Seven pairs, all single plates, the anterior two pairs (figs. 67) lying flat against the body, and pairs 3–7 (fig. 68) standing out vertically above the abdomen.

Holotype male subimago, New South Wales : Kuringae Chase, 25.viii. 1955. Morphotype female subimago and nymph, same locality.

This is the first time that *Centroptilum* has been recorded from Australia.

4. Caenidae.

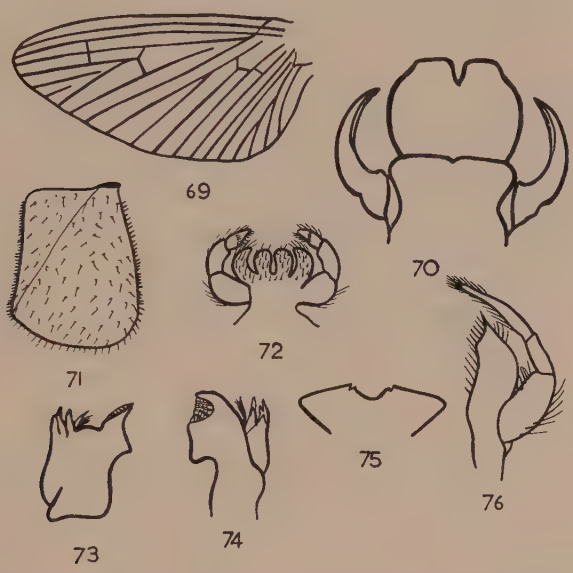
Tasmanocoenis jillongi sp. n.

Male imago.—Measurements : Body length 4·2 mm. Fore wings 4·0 mm. Caudal filaments 12 mm. *General colour :* Cream with dark brown markings. *Head :* Twice as wide as long. Eyes very large, laterally placed, black. Ocelli white and prominent. Antennae equal in length to width of head ; pedicel double length of scape. *Wings :* Fore wing (fig. 69) hyaline with chocolate-brown veins, milky in the pterostigma area. Venation close to that of *T. tillyardi*. Hind wing absent. *Legs :* Fore leg equal in length to width of wing ; coxae practically contiguous. Femur short, about half length of tibia, tarsus slightly longer than tibia. Tarsal segments in decreasing order of length : 2, 3, 5, 4, 1. Tarsal claws alike, both obtuse. Hind leg femur longer than tibia or tarsus. Tarsal segments in decreasing order of length : 5, 4, 3 = 2, 1. Tarsal claws unlike, one obtuse, one acute in each pair. *Abdomen :* Cream with very pale brown markings except for segments 8–10, which are dark brown. All lateral angles of abdominal segments produced backwards to form spines. *Genitalia* (fig. 70) : Forceps with only one segment, very curved and pointed. Penis longer than forceps (unlike that of *T. tillyardi*) and partially divided in the mid-line ; the anterior margin not rounded as in *T. tillyardi*. Appendix dorsalis well developed, as long as the caudal filaments.

Nymph.—Measurements : Body length 5 mm. *General colour :* Cream with dull brown markings. *Mouth parts* (figs. 72–74) : Mandibles with well developed canines and molar area. Left mandible unusual in having the canines completely separated from the molar region. Maxillary palp 3-segmented, and longer than the galea-lacinia. First segment broad and about twice as long as the second, the distal segment longer than the first segment and considerably narrower. Galea-lacinia completely fused and ending in a sharp point. Labial palp 3-segmented, the first and second segments being about equal in length, the distal one about half as long. Paraglossae slightly longer than glossae, but narrower and pointed ; the glossae oval in shape. Labrum with a concave region on its anterior margin, bordered on either side with two denticles. *Legs :* Coxae of fore legs not contiguous. Coxal

segment of all legs very long. Femur slightly longer than tibia, which is about twice the length of the tarsus. Tarsal claws long, narrow and denticulate. *Gills :* Six pairs : the first pair rod-like and 2-segmented, equal in length to the gills on segments 3–6. Second gill acts as a gill cover and is almost rectangular in shape (fig. 71), completely covering gills 3–6 when pressed down against the body. Second pair of gills do not touch or overlap in the median line. Gills 3–6 filamentous and roughly triangular in shape, brownish in colour with a distinct clear region around the main plate of the gill. Each filament divided several times. *Abdomen :* Lateral angles of abdominal segments all produced into spines. Appendix dorsalis well developed. The whole nymph covered with hairs.

Female.—Unknown.



Figs. 69–76.—*Tasmanocoenis jillongi* sp. n. Imago: (69) Fore wing. (70) Genitalia. Nymph: (71) Second gill. (72) Labium. (73) Right mandible. (74) Left mandible. (75) Labrum. (76) Maxilla.

Holotype male imago, New South Wales : Kuringae Chase, 25.viii.1955. Morphotype nymph, same locality.

This species appears to belong to the genus *Tasmanocoenis* Lestage by virtue of its imaginal characters. The nymphs, however, are unlike those of *T. tillyardi*, the only known nymph of this genus. Neither are they typical *Caenis* nymphs, differing from that genus by the separation of the coxae of the fore legs and the form of the maxillae and the labium. For the present, therefore, the species is placed in the genus *Tasmanocoenis*.

5. Summary.

Nine new species, and one new genus of Ephemeroptera from Australia are described.

6. References.

Harker, J. E., 1950, Australian Ephemeroptera. Part I. Taxonomy of New South Wales species, and evaluation of taxonomic characters. *Proc. Linn. Soc. N.S.W.* **75** : 1–34.

——, 1954, The Ephemeroptera of Eastern Australia. *Trans. R. ent. Soc. Lond.* **105** : 241–268.

THE GENUS *SISYRNODYTES* LOEW (DIPTERA : ASILIDAE).

By H. Oldroyd.
(*British Museum* (*Natural History*)).

The small, bee-like flies of this genus are easily recognised by the distinctive wing-venation (fig. 1), in which the first and fourth posterior cells are both closed, and no vein reaches the margin behind the wing-tip. The costa ceases just beyond the tip of vein R_4, and the entire hind margin of the wing is membranous.

This type of wing venation is seen in several genera of the tribe Laphystiini (e.g. *Glyphotriclis*), but in that tribe the prosternum is large and contiguous with the pronotum. In *Sisyrnodytes*, on the other hand, the prosternum is small and lies close to the fore coxae, separated from the pronotum by a broad stretch of membrane. In current classifications, *Sisyrnodytes* falls into the tribe Saropogonini, and is obviously closely related to *Acnephalum* Macquart. *Acnephalum* has the costa extending entirely round the wing, the veins reaching the hind margin, and the first posterior cell open, but it shares with *Sisyrnodytes* the long, curved claws, almost or quite without pulvilli, the coarsely punctured integument, and the often coarse hairs of thorax and abdomen.

Genus **Sisyrnodytes.**

Sisyrnodytes Loew, 1856, *Neue Beiträge zur Kenntnis der Dipteren* **4** : 40. Type species : *Sisyrnodytes floccus* Loew (= *nilicola* Rondani), monotypic.

Varying in size from 5–11 mm., but otherwise very homogeneous in structure and appearance.

Head.—Vertex only 2–3 times as broad as ocellar tubercle, and narrowing down to level of antennae. Face gently and moderately rounded, not noticeably prominent. Frons and face usually concealed beneath thick, coarse hairs, which are white or yellowish in females ; in the males of some species the lower mystax, hairs of palpi and beard are black. Antennae with first two segments small ; third awl-like, nearly twice as long as first two together ; followed by a two-segmented apical style, of which the first segment is short, the second about four times as long. The antennae are generally black, but with the extreme tip of the style white ; sometimes a little brownish in part.

Thorax.—Black, mesonotum coarsely punctate, pleura smooth, clothed with coarse hairs, among which definite bristles can be distinguished laterally, and on margin of scutellum ; hairs predominantly white, or mixed with yellow or red ones, or occasionally a few black ones ; those of scutellar margin strong and upcurved. Pleural hairs mostly confined to pro- and mesopleural tufts and a metapleural tuft in front of halteres. Postscutellum (" metanotal slopes ") bare.

Abdomen.—Dorsum nearly always black in ground colour, only rarely slightly reddish. Coarsely punctate, but often entirely concealed beneath thick, coarse hairs ; fringes along hind margins of segments long, white as a rule ; hairs on rest of tergite may be yellowish, reddish or black. Laterally there may be tufts of dense hairs, as in figure 1, but these are absent in the type species. Ventral hairs often pale in females and may be black in males.

Genitalia of males provide useful characters for separation of species : shape of ninth sternite (*S*), parameres (*P*), and hooked process (*H*), as in figures 2–6. The sternite can often be seen without dissection, but for a complete examination I have cut off the tip of

the abdomen and boiled it in 10 per cent. KOH, neutralised in glacial acetic acid, cleared in xylol, and mounted dry on a card point, without dissection. In this way the various organs can be seen in natural shape, without distortion.

Fig. 1.—*Sisyrnodytes major* Adams. Male.

Legs.—Stout, but not greatly swollen, except sometimes the hind tibiae. Tibiae and tarsi especially with very strong bristles in rows, and legs also covered with coarse hairs. Colour of legs normally black, but one or two species have them partly or wholly red. Pulvilli entirely absent in most species, but they may be rudimentary, and in one species (*luscinius*) they are present as perfect miniatures. Claws long, smoothly curved, black.

Wings.—Venation as in figure 1, with only very slight modifications : the amount by which the veins fail to reach the hind margin varies, and some species have a small appendix to vein R_4. In some species the wing is entirely clear and colourless, but in most there is a little yellow-brown colour towards the base and in one species only the hind margin is irregularly paler.

Since the species differ only superficially from each other, the descriptions given below have been abbreviated as much as possible. Thirteen specific names exist, but I have felt compelled to reduce these by synonymy to seven, as it seems to me that there has been a marked tendency to describe single species of *Sisyrnodytes* without adequately comparing them with others, and without taking into account the strong sexual dimorphism that sometimes occurs. In some species the females have the hairs nearly all pale, whereas the males of the same species have all the hairs black that can be seen in side view : palpi, lower face, pleura, sides and venter of abdomen, and legs. On the other

hand, I have to recognise a further three species that seem to be undescribed, making a total of ten valid species, as follows :

1. **apicalis** sp. n.
2. **aterrimus** Engel.
3. **brevis** Macquart.
   contrarius Walker = *nilicola*.
4. **curtus** Wiedemann.
   disjunctus Séguy = *major*.
5. **erebus** sp. n.
   floccus Loew = *nilicola*.
   eucophaeatus Séguy = *nilicola*.
6. **luscinius** Walker.
7. **major** Adams.
   niger Bezzi = *major*.
8. **nilicola** Rondani.
9. **niveipilosus** Ricardo.
   rufus Séguy = *nilicola*.
10. **subater** sp. n.

It seems that little attention has previously been paid to distribution, with the result that *S. brevis* has been recorded as occurring throughout the length of the African continent. The species, as I recognise them, conform to a common pattern of African zoogeography : one (*nilicola*) covers the northern deserts from Morocco to Arabia ; one (*erebus*) is West African ; one (*major*) ranges down the eastern side, from Eritraea to Moçambique ; three are limited to the Rhodesian Highlands ; and the rest are South African.

Key to the Species of *Sisyrnodytes*.

1 Abdomen mostly brick-red without any pattern of white hairs. Vein R_4 with a distinct, short appendix. Tarsal claws with well-formed miniature pulvilli . . . . . **luscinius** Walker

Abdomen black, or only faintly reddish : often with pattern of white hairs on hind margins of segments, or entirely obscured by white hairs. Vein R_4 with no more than a trace of an appendix. Pulvilli either entirely absent, or present as a mere rudiment 2

2 Wings almost entirely brown, with only the extreme edge paler, in both sexes. Pleura and legs covered with black hairs in males, pale hairs in females . . . . . **erebus** sp. n.

Wings with not more than the basal half brown, or entirely clear . 3

3 Hind tibiae with at least some of the strong bristles black, though there may be fine white hairs as well 4

Strong bristles of hind tibiae all pale or reddish 6

4 Wings distinctly stained yellow-brown on basal third or more. Abdomen with conspicuous lateral tufts (fig. 1) 5

Wings entirely clear, or with only a little colour at extreme base. Abdomen without conspicuous lateral tufts. Male genitalia as in figures 4, 5 **aterrimus** Engel

5 Abdomen with interrupted white hair-fringes on all visible segments. Wings stained only about as far along as anterior cross-vein. Mesonotum without any clearly defined spots of black hairs anteriorly. Male genitalia as in figures 4, 5, but with the sternite narrower and the paramere not bent backwards so far . . . . . **major** Adams

Abdomen with interrupted white hair-fringes on first three segments only, others with almost exclusively black hairs. Wings stained faintly as far as tips of closed posterior cells. Mesonotum with two pairs of distinct spots anteriorly, formed by clusters of black hairs **apicalis** sp. n.

6 Hind tibiae black, or blackish-brown in ground colour, though this may be obscured by white hairs 7
Hind tibiae reddish in ground colour 8

7 Hairs of body and legs are coarse, and cover the ground colour almost completely. Male genitalia with a broad sternite, as in figure 6 **nilicola** Rondani
Hairs of body and legs do not obscure ground colour, but include areas of fine, silky hairs. Male genitalia with a narrow, triangular, or strap-like sternite (fig. 2) . . . . . **brevis** Macquart

8 Body covered with a mixture of red and white hairs. Abdomen of female with red hairs and white posterior band on each segment; in male with yellow hairs only. Male with unusually long hairs on thorax **niveipilosus** Ricardo
Hairs of body predominantly white or black; if reddish hairs are present they are segregated from white ones 9

9 Femora red with a dorsal black stripe. All visible abdominal segments with mainly blackish hairs, and two widely separated white fringes on each segment . . . . . **curtus** Weidemann
Femora blackish with red tip. First three abdominal segments with blackish hairs; last three tergites obscured by silvery white hairs **subater** sp. n.

Sisyrnodytes apicalis sp. n.

Closely allied to *major* and possibly only a southern race of it, but, in view of the definite differences, as well as of the wide separation of locality, I think this is unlikely. *S. apicalis* is the only species besides *erebus* to have the brown stain on the wing reaching as far as the tips of the veins, and in *apicalis* it does so only faintly.

Hairs of *mesonotum* well preserved in unique type, and mixed white and reddish-brown, with a few black ones, and with a narrow white median line; astride this, anteriorly, are one or two pairs of distinct round spots formed of black hairs, and laterad to these can be seen two pairs of spots formed by white hairs, one on anterior margin and one on transverse suture. Scutellum also has mixed white and reddish hairs, with black hairs on margin, whereas scutellum of *major* has yellow hairs and bristles only. *Abdomen* with interrupted white fringes on first three segments only, rest with only isolated white hairs. *Length* 9 mm.

Holotype in the British Museum (Natural History).

Distribution.—Holotype ♂, Cape Province: Cape Town, Milnerton (*R. E. Turner*).

Date.—February.

Sisyrnodytes aterrimus Engel.

Sisyrnodytes aterrimus Engel, 1929, *Ann. Transv. Mus.* **13**: 170.

This species is rather strongly sexually dimorphic, the male (as described by Engel) being very black, with clear wings and the bands on the abdomen inconspicuous; the female more yellowish-grey, with pale hairs, especially on thorax and legs, and with more conspicuous abdominal bands.

A number of the females that I include in *aterrimus* have previously been labelled "*brevis* Macq.", while the males have mostly been labelled "*niger*

Bezzi ". True *brevis* is a South African species, in which the leg-bristles are white, as was clearly stated by Macquart, whereas in *aterrimus* they are black. From *major* it can be clearly separated by the male genitalia, as well as by the wing-colour.

Engel describes his species as having black hairs only, but then qualifies this by saying that one of the two specimens did have some white hairs. I believe that his two specimens were rubbed, and that his name can properly be used for the present material.

Male.—An intensely black fly, relieved only by white hairs on frons, vertex and upper part of face ; sparsely on mesonotum, especially at sides ; and sparsely on first two abdominal segments. These are subject to variation, and are easily lost by rubbing. All other hairs and bristles black. Wings clear, hyaline, except for extreme base up to humeral vein, which is brown. Male genitalia as in figures 4, 5, with a very broad sternite.

Female.—Agrees with male in basic colouring of body and wings, but looks superficially different because hairs of thorax and legs are mostly pale, and to a variable extent yellow, or even red.

Holotype was in Dr. Brauns' collection.

Distribution.—NYASALAND and SOUTHERN RHODESIA. A few females from localities in NORTHERN RHODESIA have some of the leg bristles yellow.

Dates.—June–September.

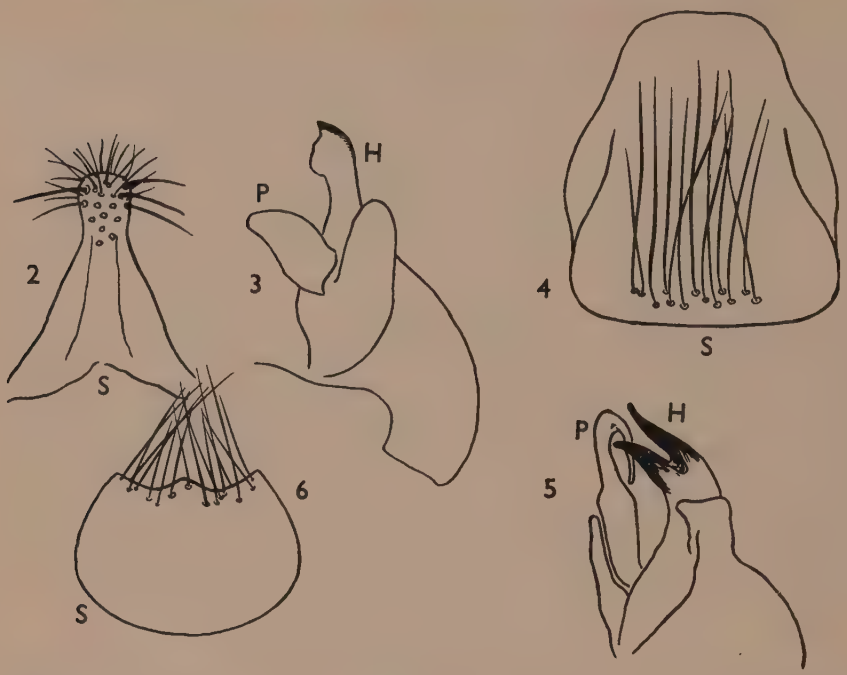
Sisyrnodytes brevis Macquart.

Acnephalum breve Macquart, 1838, *Dipt. exot.* 1(2) : 52, tab. iv, fig. 3 ; Walker, 1854, *List Dipt. Brit. Mus.* **6**, suppl. **2** : 458.
Sisyrnodytes brevis Loew, 1860, *Dipt.-fauna Südafr.* **1** : 72.

Soon after Loew had defined the genus *Sisyrnodytes* for an Egyptian species he correctly transferred to it *Acnephalum breve* Macquart, on the basis of the original description. Unfortunately subsequent authors used the name *brevis* for almost any *Sisyrnodytes*, from Cape Town to Algiers. I propose to restrict the name to a group of specimens from the Cape and South West Africa.

Macquart defined his species as being black with yellow hairs, with red hairs at the vertex, and with a little brownish stain towards the base of the wing. I have seen specimens from the Western Cape and South West Africa that agree with this, and some others from South West Africa in which the wings are entirely hyaline. There seems to be no difference in the male genitalia, and for the present I regard them as belonging to one rather variable species.

Head with long white hairs ; sometimes, but not always, hairs of vertex coarse yellow or red, especially in females. Ground colour of head black, but antennae may be a little reddish. *Thorax* typically with white hairs, becoming yellow posteriorly on mesonotum, on scutellum, and on mesopleuron. *Abdomen* with hairs of first segment silky yellowish, rest white ; but there are specimens with all the hairs yellow and rather coarse, and others with hairs all fine and silky. *Genitalia* of male as in figures 2, 3 ; sternite narrow, sometimes triangular as figured, sometimes more parallel-sided and strap-like. *Legs* black, or tarsi only a little reddish. Bristles of femora and tibiae yellow, hairs mostly white, but some species have them yellow or red, on femora (except at tip) and on tibiae. *Wings* typically with basal half noticeably stained brown, but some specimens have the wings entirely hyaline. *Length* 5–9 mm.



Figs. 2–6.—Genitalia of male *Sisyrnodytes* : 2, 3 *brevis* ; 4, 5 *aterrimus* ; 6, *nilicola*. *S*, ninth sternite ; *H*, hooked process ; *P*, paramere.

Holotype in Muséum national d'Histoire naturelle, Paris.

Distribution.—South West Africa : Aus ; Neels Poort. Cape Province : Ceres District, Witzenberg Valley, 3500 feet ; Worcester.

Dates.—December–January.

Sisyrnodytes curtus Wiedemann.

Dasypogon curtus Wiedemann, 1819, *Zool. Mag.* 1(3) : 6 ; Wiedemann, 1821, *Dipt. exot.*: 229 ; Wiedemann, 1828, *Auss. zweifl. Ins.* 1 : 409.
Dasypogon (*Acnephalum*) *curtus* Walker, 1854, *List Dipt. Brit. Mus.* 6, *suppl.* 2 : 458.
Acnephalum curtum Loew, 1860, *Dipt.-fauna Südafr* 1 : 72.
Sisyrnodytes curtus Schiner, 1866, *Verh. zool-bot. Ges. Wien* 16 : 680.

I apply this name to a species with very distinctive leg colour : the legs are predominantly red, with a dorsal stripe on each femur, and the basitarsus of the middle and hind legs, black. Bristles of legs red, except for a few ventrally on tarsi ; hairs white.

Head with hairs mostly white, a few black ones in lower mystax and behind vertex. *Mesonotum* with fairly sparse white hairs and a few black ones ; coarse bristles on margin of scutellum are mixed black, white and brown. Pleura shining black-brown, with a few tufts of white or yellow hairs. *Abdomen* black, or indistinctly reddish towards tip ; hairs mostly black with only a short length of white fringe on each side of hind margin of each segment. Venter reddish. Halteres lemon-yellow. *Wings* clear (♂) or with a faint yellowish

tint in basal half (♀). Apart from the wings there is little difference between the two sexes, but the abdominal white hairs of the male are less concentrated on the hind margins, and are softer and more silky.

Holotype in Copenhagen Museum.

Distribution.—South Africa : Cape Town, Cape Point (*Simmonds*).

Date.—November.

Sisyrnodytes erebus sp. n.

This species can be distinguished from all the others by the almost entirely dark brown wings. Although in some species—e.g. in *brevis*—the extent of the brown colour is variable, it is so constant a feature of *erebus* that I think it can be relied on. This is one of the sexually dimorphic species, the males having black hairs on the pleura and legs.

Male.—Black in ground colour. Hairs of head yellowish-white on upper half, except for a few black occipital ones ; lower half of mystax, beard and hairs of palpi black. *Mesonotum* with mostly red hairs in middle, yellowish ones at sides, and in a narrow median line ; marginal scutellar hairs yellow. Pleura shining black-brown, with hairs of lower three-quarters black. *Abdomen* black, dorsally with a clear-cut pattern of hairs in two patches on hind margin of each segment. Extreme sides with black hairs, but not in such thick tufts as shown in figure 1. *Legs* black, with black hairs and bristles ; only a few white hairs at tip of mid-femora. *Wings* almost entirely stained dark brown, with only a narrow strip on hind margin, beyond tips of veins, paler.

Females.—Similar, except in two respects. Hairs of entire head, pleura and legs all yellowish-white, and a few strong bristles on tibiae are also yellow. Wings with pale border a little broader and more clearly defined.

Holotype in the British Museum (Nat. Hist.).

Distribution.—Holotype ♂, Northern Nigeria : Shaku (*Simpson*). Paratypes : Azare (*Lloyd*), 5 ♂, 15 ♀. Gambia : Kerewan, 1 ♀; Sankeni, 1 ♀ (*Simpson*).

Sisyrnodytes luscinius Walker.

Dasypogon luscinius Walker, 1849, *List Dipt. Brit. Mus.* **2** : 360.

Although Walker's type specimen is very badly broken, the red colour of the abdomen, the short appendix to vein R_4 of the wing, and the general colour of what is left of the rest of the fly, enable it to be identified with a more recent South African specimen in the British Museum.

S. luscinius is one of those with white bristles on the tibiae, and with the wing only indistinctly brownish in most of the basal half.

Head black with silky white hairs. *Thorax* black dorsally, sides and pleura with reddish hairs and bristles white. *Abdomen* with dorsum brick-red, except for first segment and base of second, which are black ; rather bare, with sparse brownish hairs, and no pattern ; hairs at sides longer and silky white. Venter reddish with white hairs. *Legs* reddish, all segments darker red or more blackish dorsally, more reddish ventrally. Bristles yellowish-white, hairs white. This is the only species I have seen in which fully developed, though miniature, pulvilli are present. *Wings* faintly brownish over most of area enclosed by the veins, and more heavily stained in basal half. *Length* about 5 mm.

Holotype in the British Museum (Nat. Hist.).

Distribution.—Cape Province : Worcester (*Turner*). The type locality was just " South Africa " (Dr. Smith).

Date.—January.

Sisyrnodytes major Adams.

Sisyrnodytes major Adams, 1905, *Kansas Univ. Sci. Bull.* **3** : 155.
Sisyrnodytes niger Bezzi, 1906, *Bull. Soc. ent. Ital.* **37** : 283.
Sisyrnodytes disjunctus Séguy, 1930, *Bull. Mus. Hist. nat. Paris* (2) **2** : 654.

This is the species shown in figure 1, and there seems no doubt of its identity, or of the fact that the other two names are synonyms.

S. major has the mesonotum covered with mainly brownish or reddish hairs, with a white line down the middle. The palpi have black hairs and the halteres black knobs. The legs are black, with reddish knees, and have some white bristles and some black ones. The wings are stained in the basal half, especially along the veins. Abdomen black, with interrupted white fringes on the hind margins, as shown in figure 1.

This species has no other special features, but it is one of those in which the males have the hairs of the pleura, venter of the abdomen, and legs black, while in the female these are predominantly yellowish.

Holotypes.—*major* in Lawrence, Kansas ; *niger* in Udine, Italy ; *disjunctus* in Paris.

Distribution.—One of the most widely distributed species, occurring from Eritraea : Asmara-Keren Road (*Guichard*), through Kenya : Witu and Wangi Dt. (*Neave*). Tanganyika : Shinyanga District (*Burtt*) to Southern Rhodesia: Salisbury (type of *major*) and Moçambique : Pompué Valley (same latitude as Salisbury) (type of *disjunctus*). Dr. Burtt took it on burnt ground, where its charred, black-and-white appearance would give good concealment.

Dates.—December–February in north ; July in south.

Sisyrnodytes nilicola Rondani.

Acnephalum nilicola Rondani, 1850, *Nuov. Ann. Sci. nat. Bologna* (3) **2** : 186.
Sisyrnodytes floccus Loew, 1856, *Neue Beitr.* **4** : 40 ; Loew, 1873, *Z. ges. Naturwiss.* **42** : 108.
Dasypogon contrarius Walker, 1870, *Entomologist* **5** : 257.
Sisyrnodytes rufus Séguy, 1931, *Bull. Mus. Hist. nat., Paris* (2) **2** : 655.
Sisyrnodytes brevis Wulp, 1899, *Trans. ent. Soc. Lond.* **1899** : 86. tab. II, fig. 10 ; Bezzi, 1906, *Bull. Soc. ent. Ital.* **37** : 283 ; Engel, 1925, *Bull. Soc. ent. Egypte* **1924** : 352 ; Engel, 1930, *in* Lindner, *Flieg. pal. Reg.* **24** : 276 ; Efflatoun, 1937, *Mem. Soc. R. ent. Egypte* **4** (3) : 251 ; but not *brevis* Macquart, 1838, *q.v.*

As far as I can see, there is just one species of *Sisyrnodytes* that occurs in the North African desert areas, from Morocco and Algeria, through Egypt, to Arabia. It is distinctive, the body almost entirely hidden by coarse white hairs, except for the mesonotum, where the hairs are yellow in contrast to the rest. On the abdomen there is some pattern of white and yellow hairs, to a variable extent. The wings are clear.

This species has often been wrongly identified with the South African *brevis*. The two are superficially not dissimilar, but the male genitalia are quite different (figs. 2, 3, 6).

Holotypes.—*nilicola* in Bologna; *floccus* ? in Copenhagen; *rufus* in Paris; the type of *contrarius* Walker is not now to be found in the British Museum, and it is not certain that it was ever there.

Distribution.—Morocco, Algeria, Egypt, Southern Arabia. Efflatoun says this is one of commonest asilids all over Egypt, and occurs everywhere in dry, sandy localities. He emphasises the great variation in the proportions of white and yellow hairs.

Dates.—December–June.

Sisyrnodytes niveipilosus Ricardo.

Sisyrnodytes niveipilosus Ricardo, 1925, *Ann. Mag. nat. Hist.* (9) **15**: 247.

Readily identified from the mixture of red and white hairs on the thorax, which in the male are exceptionally long and silky. General ground colour black.

Head.—With silky white hairs; in female a few of those close to mouth margin are red. Antennae reddish, with reddish hairs. Palpi with white hairs. *Thorax* of both sexes with a mixture of reddish-brown and white hairs; in male these are exceptionally long and silky, and there are no dark hairs on the pleura as there are in some species. *Abdomen* of female dorsally with hairs mostly red-brown, all segments with an interrupted fringe of white hairs on hind margins. Male with hairs of dorsum all yellowish-white, longer and more silky than in female. *Legs* predominantly red, but femora more or less blackish, except at tip. Bristles and hairs reddish and white. *Wings* quite clear, even at base; vein R_4 with a short appendix.

Holotype.—There is some doubt about this. Ricardo refers only to "Paratypes (five females) from Bulawayo (Rhodesia Museum)". I do not think Miss Ricardo can seriously have meant to describe a species from paratypes only, without a holotype, and I imagine a line of text was omitted. There are specimens from Bulawayo in the British Museum, which are labelled "paratype ♀" in Miss Ricardo's handwriting, but they are undoubtedly males. The best plan, no doubt, would be to consider them all as syntypes.

Distribution.—Southern Rhodesia: Bulawayo District. Northern Bechuanaland: Ghanzi, Mongolatsela (*Maurice*).

Dates.—April–May.

Sisyrnodytes subater sp. n.

This is a distinctive little species, with red tibiae, and hairs mostly silky white, especially thick on the last three abdominal segments; the mesonotum with yellow hairs and bristles posteriorly. The wings are clear except at the extreme base. It is rather similar to *curtus*, but differs in leg colour and wing marking.

Male.—Head black in ground colour, hairs mostly shining white, but bristles at vertex reddish. Antennae reddish, with white hairs. Palpi with white hairs. *Thorax* black. Mesonotum with rather sparse, but long and obvious white hairs on anterior half; posteriorly hairs and bristles are reddish-yellow. Scutellum bare, except for a single row of stiff reddish bristles. Pleura with the usual sparse hair-tufts white, except for a small orange one on upper sternopleuron. *Abdomen* black. Dorsally first three segments have short, sparse reddish-brown hairs, with longer white ones at sides; last three segments obscured by long,

dense silvery-white hairs. Venter dull reddish with white hairs. Genitalia, as far as they can be seen, resemble those of *brevis*. *Legs* red, only the femora dark red or blackish, with base and tip clear red; tibiae and tarsi entirely red. Bristles white, except for black ones at tip of hind tibia and hind tarsi, and ventrally on other tarsi. Hairs of legs entirely white. *Wings* clear, hyaline, except at extreme base, and for about half length of costal cell. *Length* 7 mm.

Holotype in the British Museum (Nat. Hist.).

Distribution.—Holotype ♂, Southern Rhodesia: Bulawayo.

Date.—September.

NOTES AND DESCRIPTIONS OF MACHILIDAE AND LEPISMATIDAE (THYSANURA).

By P. Wygodzinsky.

(*Instituto Miguel Lillo, Tucamán, Argentina.*)

[Communicated by Dr. T. Clay].

The following notes are the result of an examination of material belonging to the British Museum (Natural History), sent for identification by Dr. Theresa Clay, to whom I am grateful for submitting the specimens. A few insects collected by Dr. F. Schmid, Musée Zoologique de Lausanne, are also mentioned.

Family Machilidae.

Paramachilis acuminithorax (Lucas, 1846).

Material examined.—East Algeria: Hammam Meskoutine, 30.iii.1913, under stone (*Buxton*). 2 ♂, 2 ♀, B.M. no. 1913–229, identified as *Machilis acuminithorax* Lucas.

Graphitarsus phillipsi sp. n.

Length of body (male) 8·0, (female) 10·0 mm. Pattern unknown. Hypodermal pigment present on head and mouth parts.

Distribution of pigment on head-capsule of male as in figure 1, of female slightly more extended. Pigment of mandibles as in figure 4. Maxillary palp of female unpigmented, of male sometimes with a small spot on antepenultimate segment.

Shape and pattern of eyes as in figures 2 and 3. Line of contact: length = 0·15; length : width = 0·8. Ocelli purple, transverse, sole-shaped, their inner extremity considerably swollen, median portion very narrow.

Antennae at least as long as body; dark brown at base, with widely spaced single white subarticles[1]; articles of median and apical portion of flagellum with the intermediate jointlet and the apical subarticles 2–4 white. Only simple bristles present.

Shape of maxillary palp of male and female as in figures 5 and 6. Palp of male without distinct specialised hairs or bristles, with the exception of a few isolated ciliae on some segments ventrally.

Apical segment of labial palp strongly widened, more strongly so in male (fig. 7) than in female (fig. 8); specialised bristles absent.

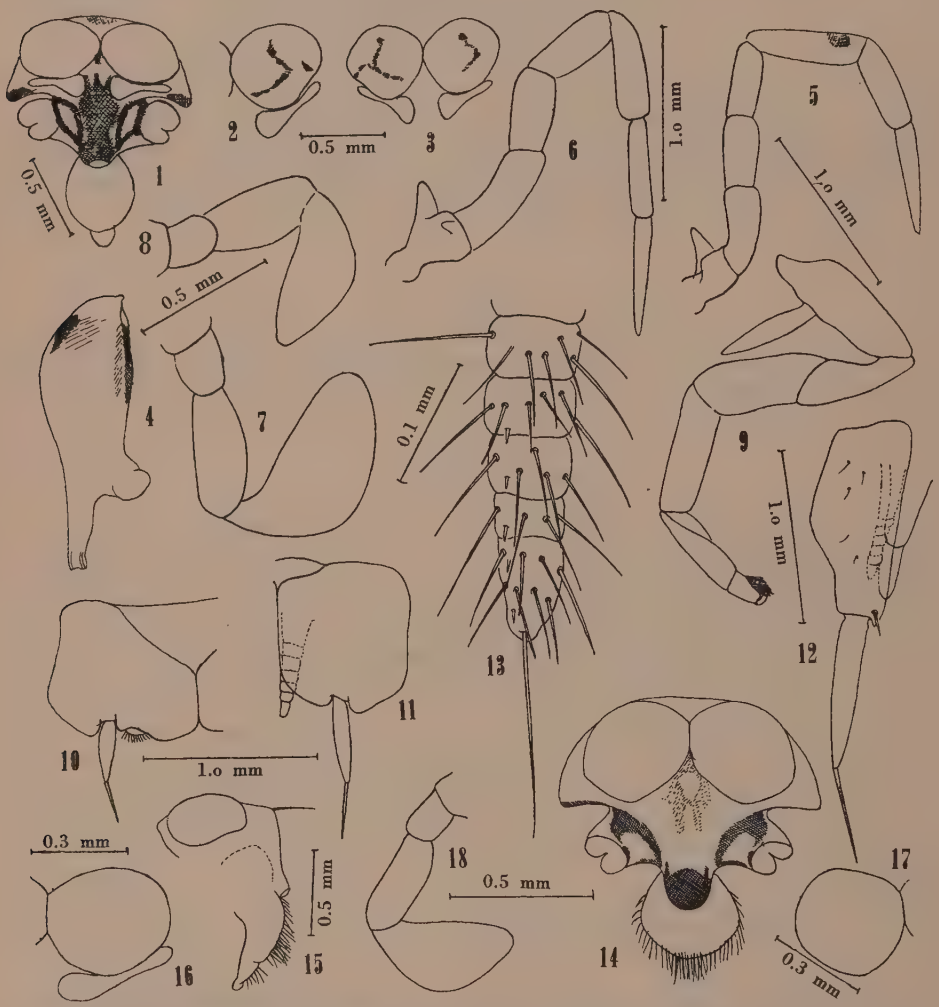
Legs as usual for the genus, without specialised setae in either sex; shape of hind leg of male as in figure 9.

Urosternites I, V, VI and VII with 1 + 1, II–IV with 2 + 2 exsertile vesicles; stylets with numerous and relatively short hyaline bristles of uniform type; terminal spine also hyaline, somewhat longer than half the length of stylet. Length of stylet: coxite on segments II–VII = 0·5, VIII = 0·55, IX = 0·8.

Parameres on segments VIII and IX, of the usual type; the anterior pair with 1 + 6–7, posterior pair with 1 + 7–8 segments. Penis slender, extending distinctly beyond apex of posterior parameres, its apical portion slender, slightly shorter than basal one, with short simple bristles; opening apical, surmounted by a very small apical projection.

[1] This term is used for subdivisions of segments of the antennae.—*Editor.*

Ovipositor of female attaining apex of terminal spine of stylet IX, of primary type. Anterior gonapophyses with 42–45 segments; the 10 basal segments with a few scattered short hairs, the remaining segments with a long seta on each margin laterally, a somewhat shorter one on disk of segment, and 2 or 3 small hairs (fig. 13); apical segments each with 1 small sensory cone. Terminal spine-like bristle as long as the last 3 segments together. Posterior gonapophyses similar; about 15 basal segments bare; apical segments with 1 large seta only, and several shorter hairs.



FIGS. 1–13.—*Graphitarsus phillipsi* sp. n. (1) Head of male, anterior view; (2) eye and ocellus, lateral aspect; (3) eyes and ocelli, frontal aspect; (4) mandible; (5) maxillary palp of male, bristles not shown; (6) *idem*, female; (7) labial palp of male, outline; (8) *idem*, female; (9) outline of hind leg of male; (10) fifth abdominal sternite; (11) abdominal sternite VIII of male; (12) coxite IX of male, with paramere and penis; (13) apex of anterior gonapophysis of female.

FIGS. 14–18.—*Graphitarsus schmidi* sp. n., male. (14) Head, anterior view; (15) head, lateral view, simplified; (16) eye and ocellus, lateral aspect; (17) eye, frontal aspect; (18) labial palp, outline. *Wygodzinsky del.*

Material examined.—Holotype ♂, allotype ♀ and 9 ♂, 15 ♀ paratypes, Ceylon: Horton Plains, Central Prov., 7000 feet, foliage of bushes, 13–14.v.1956 (*W. W. A. Phillips*). Also 1 ♂, Kandy, 14.i.1954 (*F. Schmid*) and 1 ♂, Nuwara Eliya, iii.1954 (*F. Schmid*). All specimens in British Museum (Nat. Hist.).

Only two species have been described for the genus *Graphitarsus*: *maindronii* Silvestri, 1907 (Sumatra) and *javanicus* Wygodzinsky, 1949 (Java). *G. maindronii*, known from a female only, lacks vesicles on segment VII (a character which needs verification), the relation line of contact: length of eyes is almost equal to 0·4 and the apical segment of the labial palp is only very slightly widened. In the male of *G. javanicus* (the only specimen known), the relation given is 0·3, the hypodermal pigment is absent, and the terminal segment of the labial palp is much less widened than in *G. phillipsi*.

The specimens collected by F. Schmid do not agree completely with the types; the penis is somewhat longer and more slender, and there are up to eight white subarticles on the apical part of the antennal segments. The eye pattern could not be examined.

Graphitarsus schmidi sp. n.

Male.—Length of body 8·0 mm. Pattern unknown. Hypodermal pigment present on head capsule only.

Distribution of pigment on head as in figure 14; very faint on frons. Mandibles and maxillary and labial palps not pigmented.

Pattern of eyes unknown; their shape as in figures 16 and 17. Line of contact: length = 0·35; length: width = 0·9. Ocelli not well preserved, approximately as in figure 16.

Antennae about as long as body, their colour light brown; flagellum with intermediate jointlets whitish.

Shape and chaetotaxy of maxillary palp as in foregoing species.

Apical segment of labial palp considerably widened (fig. 18); specialised bristles absent.

Legs as in foregoing species.

Sternites with appendages as in *phillipsi*; anterior parameres with 1 + 5, posterior parameres with 1 + 8–9 segments. Penis hardly extending beyond apex of posterior parameres.

Material examined.—Holotype ♂, Ceylon: Ratnapura, 15.ii.1954 (*F. Schmid*). In British Museum (Nat. Hist.).

Graphitarsus schmidi, which is named after its collector, differs from the other Ceylonese species described above mainly in the different pigmentation of its head capsule and antennae. Secondary sexual characters, which generally furnish excellent specific characters in the Machilidae, are not conspicuous in *Graphitarsus*; the differentiation between nearly related species must therefore be based on less obvious characters, such as the pigmentation.

Family Lepismatidae.

In order to place correctly the new genus described below, it was found advisable to prepare a new key for the generic determination of the Lepismatinae of the World. The only key available is completely out of date (Escherich, 1905, *Das System der Lepismatiden*) and, as a critical revision cannot yet be carried out, it is hoped that the present key will be useful for practical purposes although it is not intended to show phylogenetical relationships of the genera involved.

Practical Key for the Determination of the Genera of Lepismatinae.

1 All bristles bare, at most bifid or trifid apically 2
– Some macrochaetae feathered or barbed. 5

2 Abdominal tergites on hind border with isolated macrochaetae only, or at most with 1 + 1 infralateral bristle combs in addition to any single macrochaetae present . . . . . **Lepisma** L.
– Abdominal tergites always with infralateral bristle combs and also with at least 1 + 1 additional bristle combs composed of at least 2 macrochaetae each, or with an almost continuous row of extremely numerous setae in addition to the combs 3

3 Bristles extremely numerous ; hind margin of most abdominal tergites and sternites with an almost continuous row of very numerous setae ; body short ; caudal appendages only about as long as tergite X **Mormisma** Silvestri
– Bristles not especially numerous ; body slender ; caudal appendages much longer than tergite X 4

4 Terminal segment of labial palp strongly elongate, almost parallel-sided ; abdominal sternites with median bristle combs ; parameres of male apparently segmented . . . . . **Allacrotelsa** Silvestri
– Terminal segment of labial palp of normal shape, clavate ; abdominal sternites without median bristle comb ; parameres of male not segmented . . . . . **Isolepisma** Escherich

5 Abdominal tergites with single macrochaetae only, or with at most 1 + 1 bristle combs composed each of not more than 3 macrochaetae 6
– Abdominal tergites with 1 + 1 bristle combs composed of more than 3 macrochaetae, or with 2 + 2 or 3 + 3 bristle combs 11

6 Body subtriangular, very wide anteriorly, strongly tapering posteriorly; head almost completely hidden by pronotum ; abdominal sternites without macrochaetae . . . . . **Lepismina** Gervais
– Body not subtriangular, though sometimes distinctly widened anteriorly ; head free ; if partly or entirely hidden by pronotum, then body slender ; abdominal sternites with macrochaetae on hind border, either single or arranged in combs. 7

7 Hind border of abdominal sternites with 1 + 1 single macrochaetae only **Silvestrella** Escherich
– Hind border of abdominal sternites with macrochaetae arranged in combs 8

8 Hind border of pronotum with 2 + 2, of meso- and metanotum with 3 + 3 macrochaetae ; posterior gonapophyses of female with fossorial spines apically . . . . . **Prolepismina** Silvestri
– Hind border of thoracic nota with 1 + 1, or without, macrochaetae ; gonapophyses of female without fossorial spines 9

9 Hind border of thoracic nota without macrochaetae ; abdominal tergites with a group of 1–2 infralateral macrochaetae only ; abdominal sternites with 1 + 1 sublateral and 1 submedian bristle combs . . . . . **Braunsina** Escherich
– Hind border of thoracic nota with 1 + 1 lateral macrochaetae ; abdominal tergites with lateral and sometimes also sublateral macrochaetae in addition to infralateral group ; abdominal sternites with 1 + 1 sublateral but without submedian bristle combs. . . 10

10 Head partly or entirely hidden by pronotum ; terminal segment of labial palp with 4 minute sensory papillae which occupy a very small area only ; prosternum extremely reduced, its surface not larger than one-tenth that of mesosternum ; abdominal tergites with 1 + 1 single macrochaetae in addition to infralateral group ; ovipositor of female relatively slender, gonapophyses more or less rod-shaped **Monachina** Silvestri

— Head free ; terminal segment of labial palp with 5 large sensory papillae which occupy practically the whole anterior surface of the segment ; prosternum of normal size, its surface about one-half that of mesosternum ; some abdominal tergites with 1 + 1 lateral and 1 + 1 sublateral macrochaetae in addition to the infralateral group ; ovipositor very short and stout, gonapophyses approximately cone-shaped . . . . . **Namunukulina** gen. n.

11 Tergite X elongate, triangular, pointed apically, with at least two bristle-combs on each margin 12

— Tergite X shorter, trapezoidal, subsemicircular or shortly triangular, in the latter case not sharply pointed apically, and never with more than 1 + 1 bristle combs. 13

12 Pro-, meso- and metasternum covered by the subcoxae ; disk of prosternum with a central bristle tuft ; male with parameres **Acrotelsa** Escherich

— Median portion of thoracic sterna free, large ; prosternum without central bristle tuft ; male without parameres . . **Acrotelsella** Silvestri

13 Abdominal tergites with 1 + 1 bristle combs only, as well as with 1 + 1 single macrochaetae . . . . . **Panlepisma** Silvestri

— At least some abdominal tergites with 2 + 2 or 3 + 3 bristle combs . 14

14 Abdominal tergites I–VIII with 3 + 3 bristle combs **Hyperlepisma** Silvestri

— At least abdominal tergite I with at most 2 + 2 bristle combs, or less 15

15 First abdominal tergite with 1 + 1 infralateral bristle combs and 1+ 1 submedian macrochaetae at hind margin ; tergites II–VIII with 3 + 3 bristle-combs ; thoracic nota with some sublateral macrochaetae distant from posterior border ; caudal appendages very short, not much longer than tergite X . . . . . **Mirolepisma** Silvestri

— Chaetotaxy of first abdominal tergite different ; tergite VIII very rarely with 3 + 3 bristle combs ; thoracic nota without the macrochaetae mentioned ; caudal appendages elongate, at least half as long as abdomen 16

16 Hind border of thoracic nota without any macrochaetae **Apteryskenoma** Paclt

— Hind border of thoracic nota with macrochaetae 17

17 Hind border of thoracic nota with 1 + 1 macrochaetae **Peliolepisma** Ritter

— Hind border of thoracic nota with 1 + 1 bristle combs composed of at least 2 macrochaetae each. 18

18 At least some abdominal tergites with 3 + 3 bristle combs . . . 19

— Abdominal tergites with not more than 2 + 2 bristle combs **Lepismodes** Newman (*Thermobia* auct.)

19 Claws slender, very elongate, at least as long as last tarsal segment ; ovipositor apically with several fossorial spines . . **Leucolepisma** Wall

— Claws normal, shorter than last tarsal segment ; ovipositor never with several fossorial spines though it may have setae, confined to the apex, and rarely with a strongly chitinised point **Ctenolepisma** Escherich

The genus *Notolepisma* Tillyard, 1924, described from New Zealand, could not be included in this key, the data available being insufficient.

Isolepisma horni (Stach, 1933).

Material examined.—1 ♂, 3♀, all immature, JAMAICA: Portland, Middle Key, 14.viii.1939 (*Colman & Crisp*). Cambridge University Jamaica Expedition, British Museum (Nat. Hist.) no. 1947–345.

These specimens agree fairly well with Stach's original description, though their small size and imperfect state of preservation make the comparison of all characters difficult. *I. horni* was described from Ecuador and has not been found elsewhere.

Lepisma leleupi Wygodzinsky, 1952.

Material examined.—N. RHODESIA: Luanshya, with column of ants, *Megaponera foetens* F., 1956 (*E. L. Haydock*). Numerous males and females, British Museum (Nat. Hist.).

The specimens agree perfectly with the types described from Kanzenze, Belgian Congo. The collector reports that they were collected in a column of ants some 2 inches wide and about 50 feet long, marching between a flooded nest and a new site. The *Lepisma* were moving amongst the column apparently without fear and continued to follow the 50 feet route for some 10–12 minutes after the column of ants ended.

This species must be added to the list of South African Thysanura (*see* Wygodzinsky, 1955, *South African Animal Life* **2**: 83–190).

Lepisma saccharina L., 1758.

Material examined.—CEYLON: Agrapatna, 4800 ft., nest of *Funambulus palmarum olympius*, 20.vi.1954 (*W. W. Phillips*). 1 ♀, British Museum (Nat. Hist.).

Namunukulina gen. n.

Lepismatinae.—Small sized (type: 6 mm.); body elongate, somewhat tapering posteriorly, thorax only slightly detached from abdomen.

Scales of various types on head, body and legs to femur. Most macrochaetae barbed.

Head free. Macrochaetae of head capsule on marginal and submarginal region anterior to eyes, and in 1 + 1 irregular small groups on frons sublaterally. Eyes relatively large, composed of numerous elements. Antennae of medium size, somewhat shorter than body. Articles of flagellum with rather short hairs and isolated scoop-shaped sensillae. Mandibles without special characters, strongly chitinised apically. Maxillae normal; palp rather short, its last segment apically with a few tiny sensillae and a terminal larger one which is cylindrical and surmounted by tiny finger-like processes. Labium transverse, with 1 anterior row of macrochaetae. Apical segment of palp subcircular, with 5 rather large sensory papillae arranged in 2 rows.

Thoracic nota laterally with 1 irregular row of setae, hind border with 1 + 1 submedian macrochaetae. Sterna of normal size, prosternum not much smaller than the others; all apically with 1 + 1 bristle combs. Legs short, with numerous simple bristles and barbed macrochaetae. Tarsi 3-segmented. Three normal claws.

Abdomen somewhat longer than thorax. Tergites with 1 + 1 infralateral bristle combs composed of a very small number of setae, as well as 1 + 1 lateral and 1 + 1 sublateral

macrochaetae on some of the tergites. Tenth tergite short, its lateral border with 1 row of setae, apically with 1 + 1 macrochaetae. Sternites with 1 + 1 small sublateral bristle combs. Stylets on segment IX only. Ovipositor of female very short, subconical, gonapophyses composed of a small number of segments only, these with a moderate number of very long bristles.

Caudal appendages about half as long as abdomen.

Type species : *Namunukulina funambuli* sp. n.

Namunukulina, the name of which is taken from the locality Namunukula, seems to be rather closely related to the group of genera near *Silvestrella*, *Braunsina*, *Prolepismina* and *Monachina*. The main characters distinguishing it from these genera are to be found in the key given above.

Namunukulina funambuli sp. n.

Female.—Maximum length of body 6 mm. Colour whitish ; hypodermal pigment absent, except on sides of thoracic nota. Scales on dorsal surface dark, on ventral surface light brown (in alcohol) ; their shape mostly transverse; arrangement of rays of 2 different types (figs. 20 and 21). Setae simple, the larger ones moderately barbed (fig. 22).

Shape of body as in figure 19 ; almost parallel-sided, faintly tapering posteriorly ; sides of thorax not forming a continuous outline, faintly but distinctly detached from abdomen.

Head capsule much wider than long ; distribution of setae as in generic description and figure 23.

Antennae (poorly preserved) rather short, probably not longer than thorax. Basal articles transverse, with a single row of setae ; apical segments subdivided (fig. 24), with several rows of simple setae, isolated small sensory rods and rare scoop-shaped sensillae.

Mandibles as in figures 25 and 26.

Maxillae and palp as in generic description and figures 27–29.

Labium and palp as in generic description and figure 30.

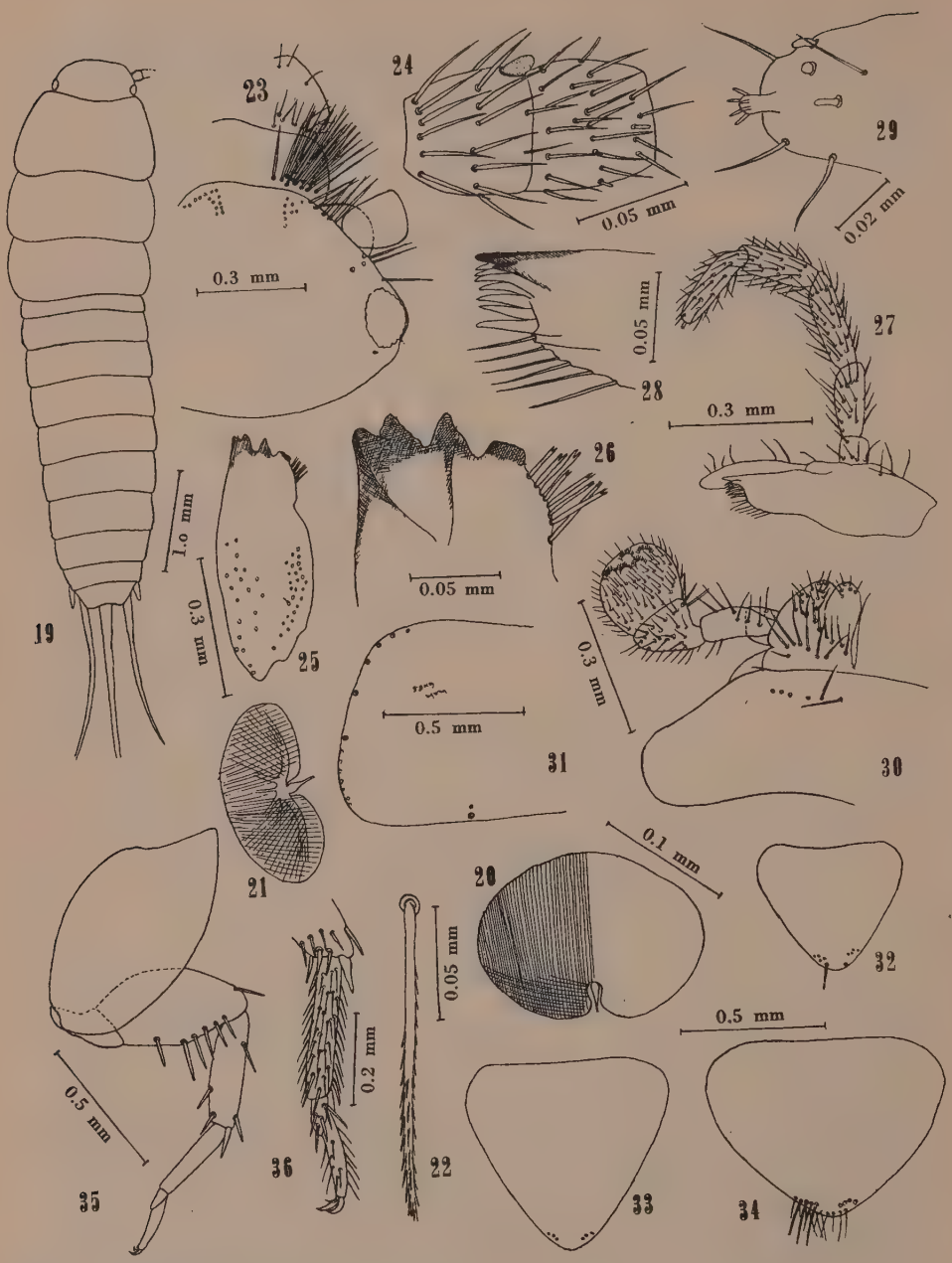
Thorax dorsally as in figure 19. Nota laterally with 10–15 isolated macrochaetae which become progressively shorter posteriorly. Hind border of nota with 1 + 1 sublateral macrochaetae, accompanied by one or two smaller setae.

Thoracic sterna subtriangular, rounded apically (figs. 32–34). Meso- and metasternum of about equal size, surface of prosternum about half that of mesosternum. All 3 apically with 1 + 1 somewhat irregular bristle combs, each composed of 2–4 macrochaetae.

Legs short and stout, with the usual hairs and bristles ; distribution of macrochaetae as in figure 35.

Abdominal tergite I with 2 + 2 infralateral macrochaetae (fig. 37). II with 2 + 2 infralateral and 1 + 1 sublateral macrochaetae (fig. 38). III–VII with 2–3 + 2–3 infralateral, 1 + 1 lateral and 1 + 1 sublateral macrochaetae (fig. 39). VIII with 2–3 + 2–3 infralateral and 1 + 1 lateral macrochaetae. IX bare. X with a row of setae along lateral margin ending apically in 1 or 2 larger macrochaetae on each side ; hind margin bare (fig. 40). Shape of tergite X subtrapezoidal, somewhat wider than long, distinctly emarginate apically.

Abdominal sternites I and II without macrochaetae. III with one median bristle composed of 3 very small macrochaetae. IV–VII with 1 + 1 lateral bristle combs each composed of 3 macrochaetae (fig. 41). Coxite VIII with a bristle comb composed of 3 macrochaetae on hind margin (fig. 42). Coxite IX with one macrochaeta on disk of sclerite near insertion of stylus at base of inner process, in addition to row of bristles on border (fig. 44). Urosternites slightly emarginate behind ; shape of coxites VIII and IX as in figures 42 and 44 ; inner process of IX much longer than outer process, about as long as



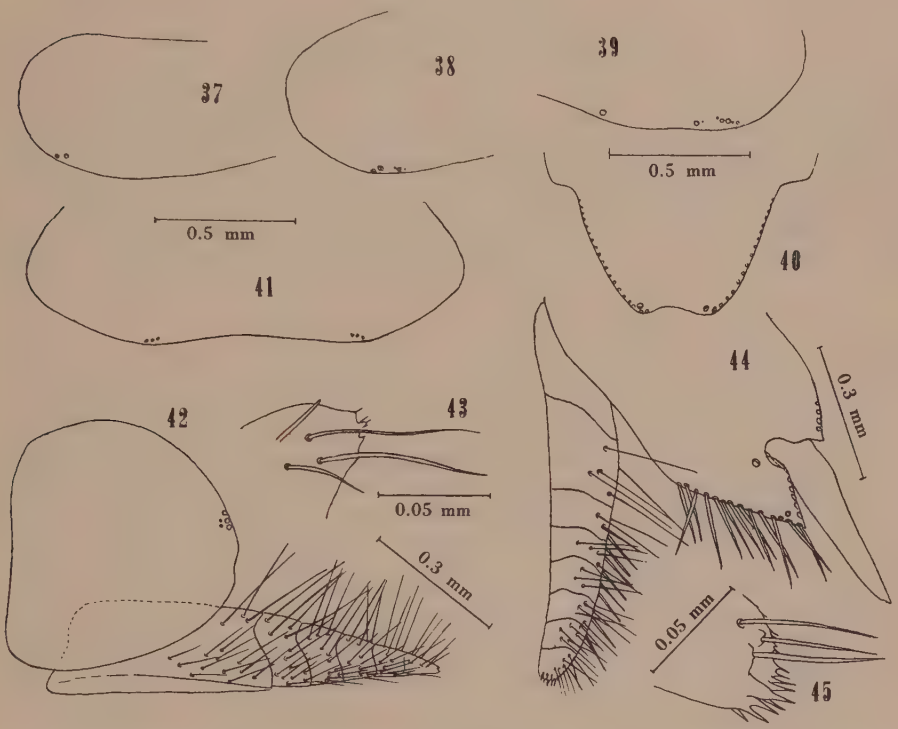
FIGS. 19–36.—*Namunukulina funambuli* gen. et sp. n., female. (19) General aspect; (20) one type of scale; (21) another type of scale; (22) typical barbed macrochaeta; (23) head; (24) article of apical preserved portion of antenna; (25) mandible; (26) apex of same; (27) maxilla with palp; (28) apex of lacinia, highly magnified; (29) apex of maxillary palp, with sensillae; (30) labium with palp; (31) metanotum; (32) prosternum; (33) mesosternum; (34) metasternum; (35) hind leg; (36) apex of tibia and tarsus of hind leg. *Wygodzinsky del.*

wide at base. Stylets on IX only, slightly more than twice as long as inner process of coxite with short bristles (not well preserved).

Ovipositor as in generic description; gonapophyses as in figures 42–45. Anterior gonapophyses (fig. 42) with 1 large basal and about 5 shorter apical segments, all beset with delicate long hairs; apex (fig. 43) with a few teeth-like projections. Posterior gonapophyses (fig. 44) with about 8 segments which become progressively shorter towards apex, beset with long hairs and along outer surface with a few stronger bristles; apex (fig. 45) with numerous spine-like projections.

Caudal appendages without special characters, with simple bristles only.

Male unknown.



FIGS. 37–45.—*Namunukulina funambuli* gen. et. sp. n., female. (37) Tergite I; (38) tergite II; (39) tergite V; (40) tergite X; (41) sternite V; (42) coxite VIII with anterior gonapophysis; (43) apex of anterior gonapophysis; (44) coxite IX with stylet and gonapophysis; (45) apex of posterior gonapophysis. *Wygodzinsky del.*

Material examined.—Holotype ♀, 5 ♀ paratypes and 2 juv., CEYLON: Tonacombe, Namunukula, Uva Hills, nest of palm squirrel, *Funambulus palmarum olympius*, 4000 feet, 21.iii.1954 (*W. W. Phillips*); *ibid.*, 12.ix.1954, 3 ♀ paratypes, 3 juv.; *ibid.*, 14.i.1955, 1 ♀ paratype, 1 juv.; *ibid.*, 18.iii.1956, 2 ♀ paratypes. All specimens deposited in the British Museum (Nat. Hist.).

The complete absence of males among the rather abundant specimens seen would indicate that the species reproduces parthenogenetically.

Peliolepisma calva Ritter, 1911.

Material examined: Ceylon: Colombo, in houses (*Cruz*). Several males and females.

This genus seems to differ from *Ctenolepisma* only in the character mentioned in the key; all other features agree so closely that it seems difficult to maintain a generic distinction.

DIESTOGYNA BUTLERI AURIVILLIUS (LEP.: NYMPHALIDAE) AND CORRECTIONS TO AN EARLIER PAPER.

By T. H. E. Jackson
(*Kitale, Kenya*)

AND

T. G. Howarth.
(*British Museum (Natural History)*).

In 1950 Hale Carpenter and Jackson (*Proc. R. ent. Soc. Lond.* (B) **19**: 102) described what they believed to be the hitherto unknown male of *Diestogyna butleri* Aurivillius. A series of both sexes taken recently in the type locality shows that this was a wrong diagnosis and the Ituri Forest insect is now described as a new species. The two species are very similar in markings, but differ conspicuously in the colour of the males.

Diestogyna butleri Aurivillius, 1904.

Male.—Nearest to *D. ribensis* Ward with which it flies, but differing mainly in the ground colour, the colour of the sheen and in the fact that the four bands on both wings are much closer together.

Upperside fore wing.—Ground colour warm brown with a brilliant reddish-purple sheen except for a strip along the costa, apex and margin. The second, third and fourth transverse bands are placed nearer to the margin than in *ribensis* and are, therefore, narrower and nearer to each other. Interspaces between these bands reddish-purple. Four white subapical dots in interspaces 4, 5, 6 and 8. The usual marks present in the cell. The second transverse band (from base) very weakly angled, almost rounded on vein 4. It is sharply angled in *ribensis*. The proximal edge of this band runs in a straight line from the inner margin to vein 4 and is then angled; in *ribensis* and *D. ituriensis* sp. n. it is bent sharply distad at vein 2. Length from base to apex 26 mm., being on the average slightly smaller than *ribensis*.

Upperside hind wing.—The first and second transverse bands conjoin to form a broader basal patch than in *ribensis*, with almost straight distal edge; the third and fourth bands narrow and close together as in the fore wing. The whole wing suffused with brilliant reddish-purple except for margin and narrow strip along costa. The bands on both wings more macular than in *ribensis*.

Underside.—Coloration much as in *ribensis* but ground colour darker olive-brown, less ochreous. Second transverse band on fore wing very weakly angled at vein 4. Subapical area of fore wing and distal edge of basal area of hind wing violet; the fainter distal violet band on hind wing in *ribensis* is virtually missing in *butleri*. The basal area of hind wing reaches further distad than in *ribensis* and the first and second transverse bands are divided by a much narrower violet bar. A row of small black dots is present along the distal edge of the third transverse band on both wings, being proximally white in interspaces 2, 3 and 4 of hind wing and 3, 4 and 8 of fore wing, which are rather more prominent than in *ribensis*.

Antennal club black, red-brown ventrally; palps and legs olive-brown; abdomen above black with olive-brown hairs, below grey.

Neallotype ♂, Uganda : Toro, Mpanga Forest, v.1956 (*T. H. E. Jackson*), B.M. Type No. Rh. 16092. In British Museum (Natural History).

Distribution.—Known only from the Mpanga Forest, Toro, Uganda, and Semliki. Butler's " type female " of *amaranta* Karsch (recte *butleri*) was taken by Sir H. Johnston in 1900.

The British Museum also possesses four other females labelled : (1) Toro, Uganda, 26.'05. Adams Bequest B.M. 1912–399, (2) Semliki. Ex coll. Suffert. 1912. Joicey Bequest. Brit. Mus. 1934–120, (3) Butiti, Toro, B. E. Africa (*A. L. Kitching*). G. T. Bethune-Baker Coll. B.M. 1927–471, (4) Coll. 22.xi.1911. Uganda, Toro. W., 4800. Mpanga Forest, of Mt'n type, v. cool and dense : v. cold & wet at date. S. A. Neave. Brit. Mus. 1912–140 : and two males labelled (1) Semliki valley, February 1903 (*Capt. Rattray*). Rothschild Bequest B.M. 1939–1. (2) Forest 90 km. west of L. Albert-Edward, Febr. '08. 1000 m. (*R. Grauer*). Rothschild Bequest B.M. 1939–1.

The male of this species remained unrecognised until May, 1956, when it was found by Dr. V. G. L. van Someren and T. H. E. Jackson. Two pairs were taken *in cop.*

Diestogyna butleri **kivuensis** ssp. n.

Male.—Very similar to *butleri butleri* from the Toro District but on the upperside has the pale bands more ochraceous and very slightly broader, especially the discal band of the fore wing. On the underside the pale markings are a little more extensive and the dark wavy submarginal band of the hind wing is more distinct. Length of fore wing 27 mm.

Female.—Easily separable from *butleri butleri* by the upperside being more ochraceous and the fore wing having the yellow post discal band much broader, especially in interspaces 2 and 3 (6 mm. as against 4 mm.). The underside differs in the same way as the upperside and has the dark submarginal line of the hind wing as in the male. Length of fore wing 33 mm.

Holotype ♂, Belgian Congo : Kwidgwi Is., L. Kiwu, 1500–2000 m., xi.1907 (*R. Grauer*) Rothschild Bequest. B.M. 1939–1, B.M. Type No. Rh. 16068.

Allotype ♀, same data as holotype, B.M. Type No. Rh. 16069.

Paratypes.—Two ♂ and 4 ♀, same data, B.M. Type No. Rh. 16070–16075.

All types in Brit. Mus. (Nat. Hist.).

Diestogyna ituriensis sp. n.

The species described by Hale-Carpenter and Jackson (*loc. cit.*) as *D. butleri* (male) is without a name. For convenience the description of the male is repeated here ; the details in square brackets have been added by the present authors.

Male.—Nearest to *D. ribensis* Ward, differing as follows : Sheen on upperside steel-blue instead of purple. The distal line bounding the second dark transverse band of the fore wing, which is the line separating the basal from the distal area, is weakly rounded, whereas in *ribensis* it is sharply angled at vein 4.

The blue area between the second and the third transverse bands on both wings is narrower than in *ribensis* (2 mm. as against 4 mm.).

Upperside fore wing.—Steel-blue, with dark blackish-brown apex and distal margin. Four dark transverse bands, the second differing from that of *ribensis* as already described, the third and fourth divided into spots by streaks of steel-blue along the veins. [The proximal edge of the second transverse band sharply kinked distad on vein 2.] The usual three dark spots in the cell, the first, near the base, being smaller. Minute white spots in areas 6 and 7 [interspaces 7 and 8], between the third and fourth transverse bands. An unusual character is a small triangular spot, outlined in steel-blue, at the base of area 2. [Length 26 mm.]

Upperside hind wing.—Steel-blue, with blackish-brown marginal band 2 mm. broad and four dark transverse bands very nearly as in *ribensis* ; the second, however, is very broad and almost contiguous with the first. A dark line marks the discocellulars.

Underside.—Shows even closer affinity with *ribensis* than does the upperside.

Fore wing.—Powdered with mauve scales along costal margin for a width of 5 mm., which includes the cell ; remainder of wing tawny brown as in *ribensis*. The transverse spots in the cell are darker than the ground colour. The median line is prominent and shows the same differences from that of *ribensis* as on upperside. In the distal half of the wing a series of minute pale spots separates the dark bands ; that in area 8 being the most, that in 1*b* the least conspicuous ; there is none in 7 ; the series is continued across the hind wing.

Hind wing.—Three dark bands from costa to the inner margin are separated from each other by bands of greyish-mauve very much as in *ribensis*. The margin is broadly chocolate-brown, whereas in *ribensis* it is tawny. In the cell is a minute dark chocolate-brown dot. Fringes of the wings with minute white dots at [centrally between] the veins.

Head black above, greyish-mauve below ; palps grey-brown ; antennae black above, brown below.

Holotype ♂, Belgian Congo : Ituri Forest, Beni, iii.1947 (*T. H. E. Jackson*), B.M. 1950–475, B.M. Type No. Rh. 16066. In Brit. Mus. (Nat. Hist.). Nine paratypes in Coll. Jackson. Beni (8), Irumu (1).

The female has not been described previously.

Female.—Nearest to female of *butleri kivuensis*.

Upperside fore wing.—Ground colour brown, slightly paler than in *butleri*. A discal yellow band from inner margin to vein 9, as placed in *butleri* but the large spots in spaces 2 and 3 broader and projecting further distad, being intermediate between *butleri* and ssp. *kivuensis*. The proximal edge of the second brown transverse line sharply kinked distad on vein 2 ; in *butleri* this line is straight. Small white dots in cellules 4, 5, 6 and 8 before the apex and white marginal dots centrally between the veins as in *butleri*. Length 32 mm.

Upperside hind wing.—As in *butleri* ; the first and second transverse bands obscurely divided, but rather more so than in *butleri* ; the third broader, the fourth broader and less macular. The distal edge of the second band, which is the line dividing the basal area from the rest of the wing and an important character in this genus, more undulate and with small distal projections ; in *butleri* it is almost straight. Small white marginal dots centrally between the veins.

Underside.—Coloured almost exactly as in *butleri, i.e.* violet-grey scales in apical area and cell of fore wing, in all interspaces between the transverse bands of the hind wing. Inner marginal area of fore wing ochreous ; transverse bands of hind wing chocolate-brown. Differs from *butleri* as follows : distal edge of basal area of fore wing projecting boldly in 2 and 3 ; thereafter kinked inwards towards the base in space 1. In *butleri* this line is uniformly rounded. Basal line of hind wing somewhat straighter than in *butleri*. Ground colour paler.

Abdomen and palps black-brown above, below pale ochreous-grey ; antennae black above, russet below.

Allotype ♀, Belgian Congo: Ituri, Beni, xii.1946 (*T. H. E. Jackson*), B.M. 1956-616, B.M. Type No. Rh. 16067. In Brit. Mus. (Nat. Hist.). Five paratypes in Coll. Jackson.

Distribution.—Eastern Belgian Congo: Ituri Forest, Beni and Irumu. This fine species has not so far been found elsewhere.

Note.—The coloured plate of the male (*loc. cit.*, Pl. I, fig. 9, *Diestogyna butleri* neallotype male) is too dark, the sheen on both wings is brilliant steel-blue.

Charaxes smaragdalis caerulea Hale Carpenter and Jackson.

The female described as belonging to form *caerulea* (*loc. cit.*) is the only form occurring in parts of Western Uganda and with its male constitutes a good subspecies. The male is indistinguishable from that of *Ch. smaragdalis orientalis* Joicey and Talbot.

Distribution.—Kibale Forest, Toro; Kalinzu Forest, Ankole; probably also Kigezi District although no females have been taken from there; all West Uganda.

Pseudacraea boisduvali marsabitensis Hale Carpenter and Jackson (*loc. cit.*).

Originally described as a form, it should now be raised to subspecific rank. Some 50 specimens of both sexes of this insect were taken and, with one exception, all conform to the description given of *marsabitensis*. The presence of one example of another form does not invalidate a geographical race; the exception may be a throw-back to the ancestral race or may be due to infiltration of ssp. *trimeni* Butler from the south *via* Matthews Range, or of ssp. *sayonis* Ungemach from the north *via* Omo River and Horr Valley. The subspecies is very constant and distinct.

Acknowledgment.

Thanks are due to Mr. N. D. Riley, C.B.E., of the Department of Entomology, British Museum (Natural History), for much help with the publication of this note.

PLATE I.

Uppersides (natural size).

Fig. 1.—*Diestogyna butleri* Aurivillius male.

Fig. 2.—*Diestogyna butleri* Aurivillius female.

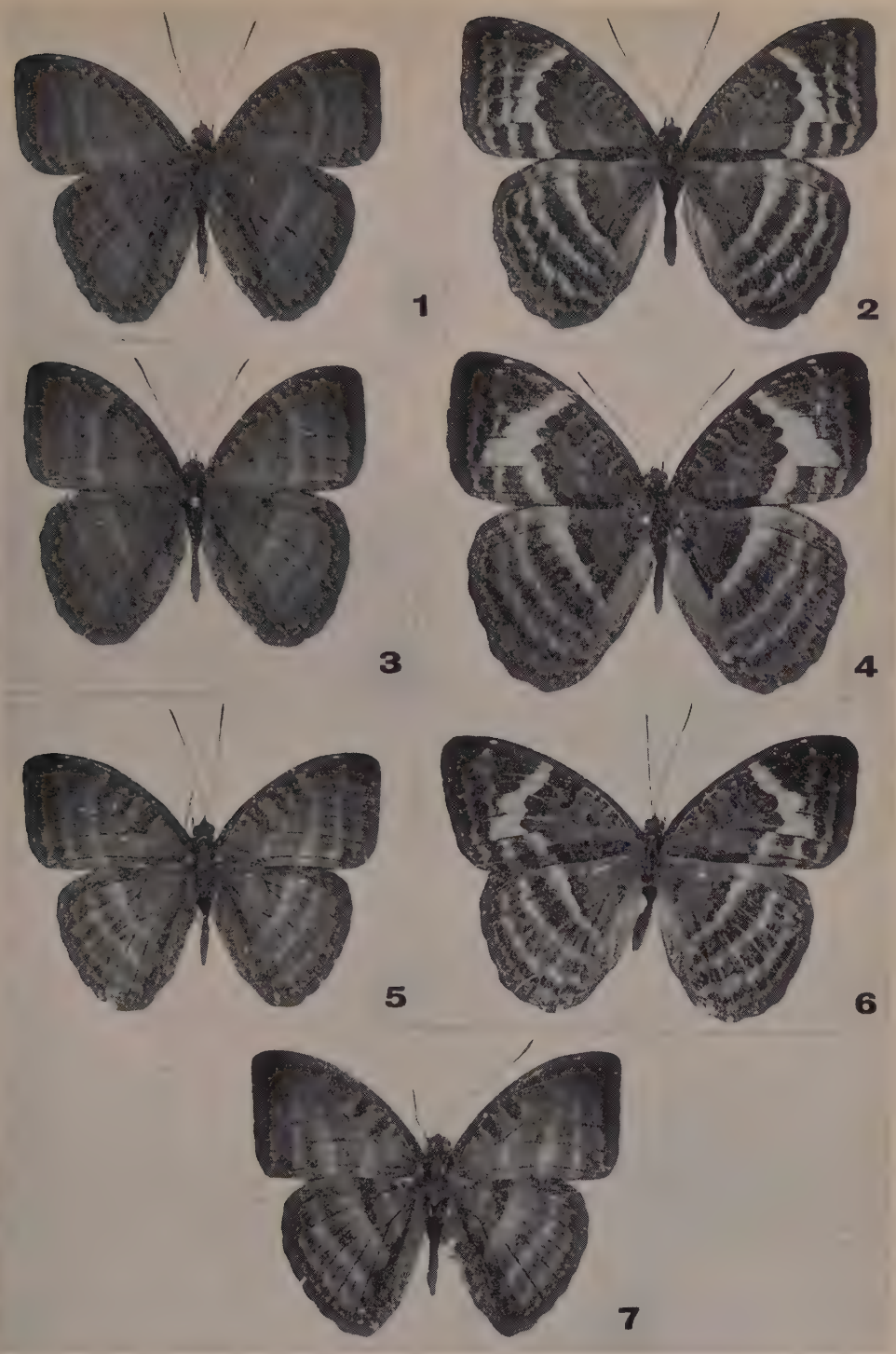
Fig. 3.—*Diestogyna butleri* ssp. *kivuensis* holotype male.

Fig. 4.—*Diestogyna butleri* ssp. *kivuensis* allotype female.

Fig. 5.—*Diestogyna ituriensis* holotype male.

Fig. 6.—*Diestogyna ituriensis* paratype female.

Fig. 7.—*Diestogyna ribensis* Ward male.



T. H. E. Jackson and T. G. Howarth.

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PLATE II.

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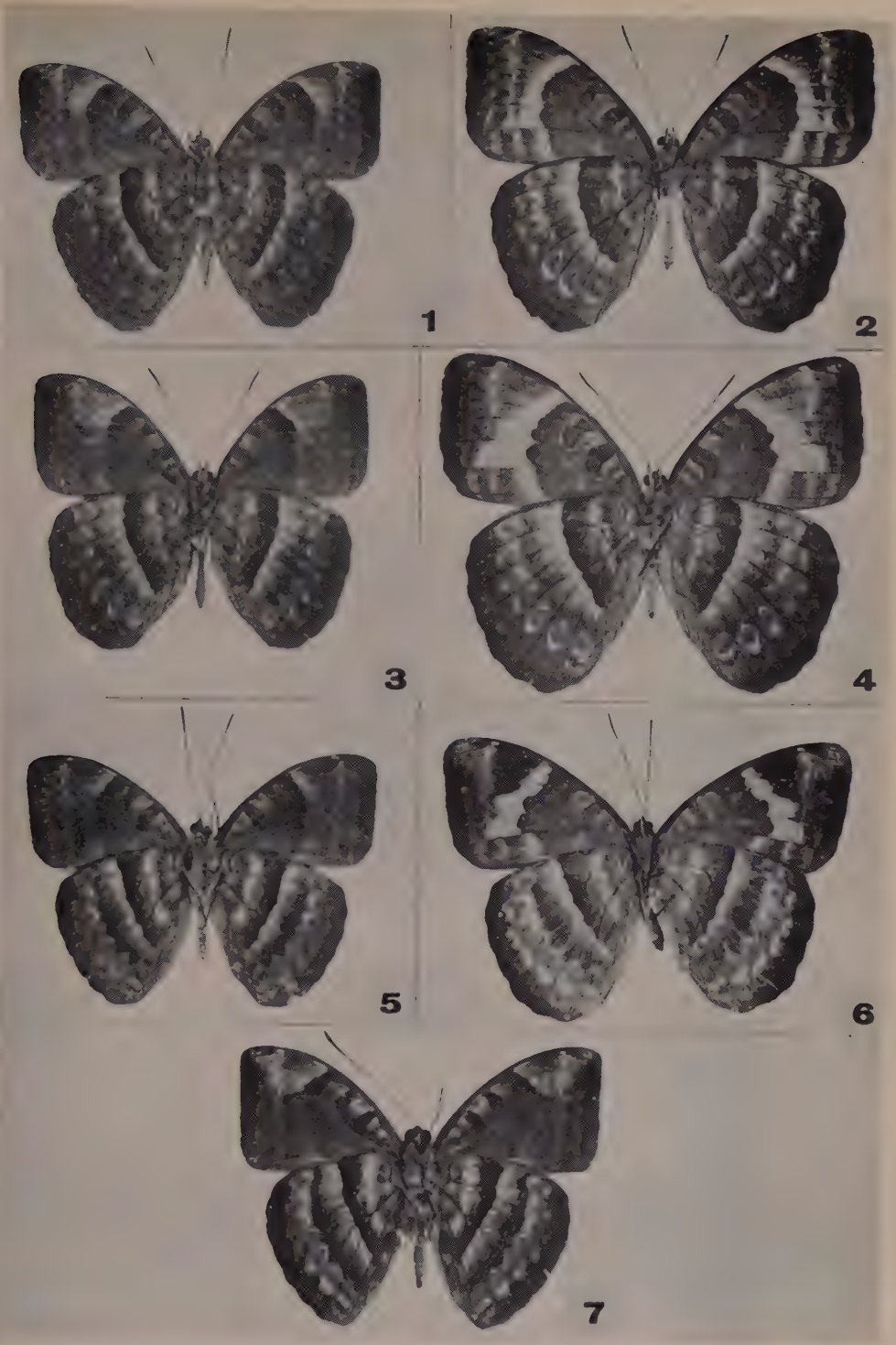

T. H. E. Jackson and T. G. Howarth.

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THE TAXONOMIC POSITION OF *CARYEDON FUSCUS* (GOEZE), *C. GONAGER* (FABRICIUS) AND *C. LANGUIDUS* (GYLLENHAL) (COLEOPTERA : BRUCHIDAE) BASED ON A STUDY OF THE GENITALIA.

By the late S. Mukerji,
M. G. Ramdas Menon
and
S. N. Chatterjee.

(*Division of Entomology, Indian Agricultural Research Institute, New Delhi*).

Bridwell (1929), in his preliminary generic arrangement of the palm Bruchids and their allies, indicated that, if his interpretation of the species *Caryedon fuscus* (Goeze, 1777) and its synonymy were correct, some 19 or more specific names have, in fact, been applied to this particular species, *Bruchus gonagra*[1] (Fabricius, 1798) and *B.* (*Caryeborus*) *languidus* (Gyllenhal, 1839) being specially mentioned by him. While he himself did not have an opportunity of examining the type of *Bruchus fuscus* Goeze, he based his conclusions on Bedel's findings (1901), after a comparison of the types, that *Bruchus serratus* (Oliver, 1790) is a synonym of *B. fuscus* Goeze. To support this synonymy Bedel also indicated that the types of both these species were collected by the younger Geoffroy in Senegal. Schoenherr (1823) had designated *B. serratus* Oliver as the type of his genus *Caryedon*. On the basis of Bedel's synonymy Bridwell stated that the type species of *Caryedon* was, therefore, *Bruchus fuscus* Goeze.

In an earlier contribution Mukerji and Chatterjee (1951) have described the genital armatures of specimens identified as *Pachymerus languidus* (Gyll.) (= *Caryedon languidus*) and *P. gonager*[1] (Fabricius) (= *C. gonager*) from the National Collection of the Indian Agricultural Research Institute, Pusa, and have shown that these are specifically distinct. The identity of the specimens dissected has been established from material determined by the Commonwealth Institute of Entomology, London. Recently, through the help and co-operation of Dr. R. W. Howe of the Pest Infestation Laboratory, Slough, Bucks., England, the authors have had the opportunity of studying *Bruchus fuscus* Goeze (= *Caryedon fuscus*), with certain interesting results.

Caryedon fuscus (Goeze).

Male genital armature (fig. 5).—The lateral arches (*la*) distinct dorsally and slightly extended towards the middle of the phallobase (*PHB*). Curved spine-like processes (*Phb. pr*) present at the apices of the arches, pointing distad, and also on the dorsal side of the phallobase. Ventrally the lateral arches form the broad-based, elongate leaf-like hypomere. Phallobase subtriangular and broad at base. Parameres short, thick, with depression at apex bearing fringes of hairs. Distal portion of exophallus extending in an apically-pointed triangular piece. Exophallic apodeme (*ex. ap*) large, shield-like, the proximal border rounded and occupying two-thirds of the entire length of the genitalia.

Endophallus with a series of paired denticles (I, II and III, *en. ar*); the anterior group (I *en. ar*) consists of two pairs of elongate rod-shaped structures; the anterior pair of these being bent at their proximal end like the handle of a walking-stick; the posterior pair somewhat similar, but each possessing a shorter bend and a process at its proximal

[1] The specific name is given as *gonagra* and *gonager* by different authors. The present authors have followed Pic (1913) in using the specific name *gonager*.

end like the thumb-rest on a modified walking-stick handle. The elongate distal ends of these armatures very closely packed and entirely covered with numerous small spines, forming a bottle-brush like structure. Two more pairs of denticles (II, III *en. ar*) present posterior to these endophallic armatures ; the outer pair (III) broad-based and sickle-shaped ; the inner pair (II) similar but shorter and about half as long as the outer pair. Beyond these denticles, posteriorly, numerous minute spines (*sp*) present, forming a roughly triangular area.

Female genital armature (fig. 7).—The bursa copulatrix (*Bu*) elongate with a long neck. Stout pointed spines, arranged in rows, present at the distal end of the neck and beyond this numerous fine spines on the wall of the bursa (*bu. ar*) ; the distal one-fourth of the bursa bare. The spermatheca (*SPR*) subglobular, retort-shaped, the beak terminating in a thin capillary tube.

Discussion.

Mukerji and Chatterjee (1951) have shown that the male and female genital structures of *Caryedon fuscus* and *C. languidus* show considerable differences in both the structure and position of the endophallic armatures in the male and also in the shape and armatures of the bursa copulatrix in the female, which are sufficient to justify their separation as distinct species.

Comparing the results of the present studies with the above, the male genitalia of *C. gonager* and *C. fuscus* are found to be similar in shape, structure and endophallic armatures except for minor differences, as follows :—

(1) The first pair of endophallic armatures (figs. 1 and 5, I *en. ar*) in *C. fuscus* bear a very large number of densely-packed small setae, giving them the shape of a bottle brush, whereas the first pair of these armatures in *C. gonager* possess small setae which are rather fewer than in *C. fuscus*.

(2) The third pair of endophallic armatures (figs. 2 and 6, III *en. ar*) in both species differ slightly in size and shape, those in *C. fuscus* being more elongate and less curved and not possessing the three prominent teeth present in *C. gonager*.

(3) The area beyond and posterior to the second and third pair of endophallic armatures (figs. 1 and 5, *sp*) in both species is entirely covered with very minute denticles. In *C. fuscus*, however, the teeth are much closer than in *C. gonager*.

(4) The processes of the phallobase (figs. 1 and 5, *Phb. pr*) on the lateral arch (*la*) in *C. fuscus* are bent and beak-like, while those in *C. gonager* are straight and more elongate.

The male genitalia of *C. languidus* are quite distinct from *C. fuscus*.

Likewise a comparison of the bursa copulatrix and spermatheca in the females indicates similarities between *C. fuscus* and *C. gonager*, except for slight morphological differences. In both the bursa copulatrix (figs. 3 and 7,

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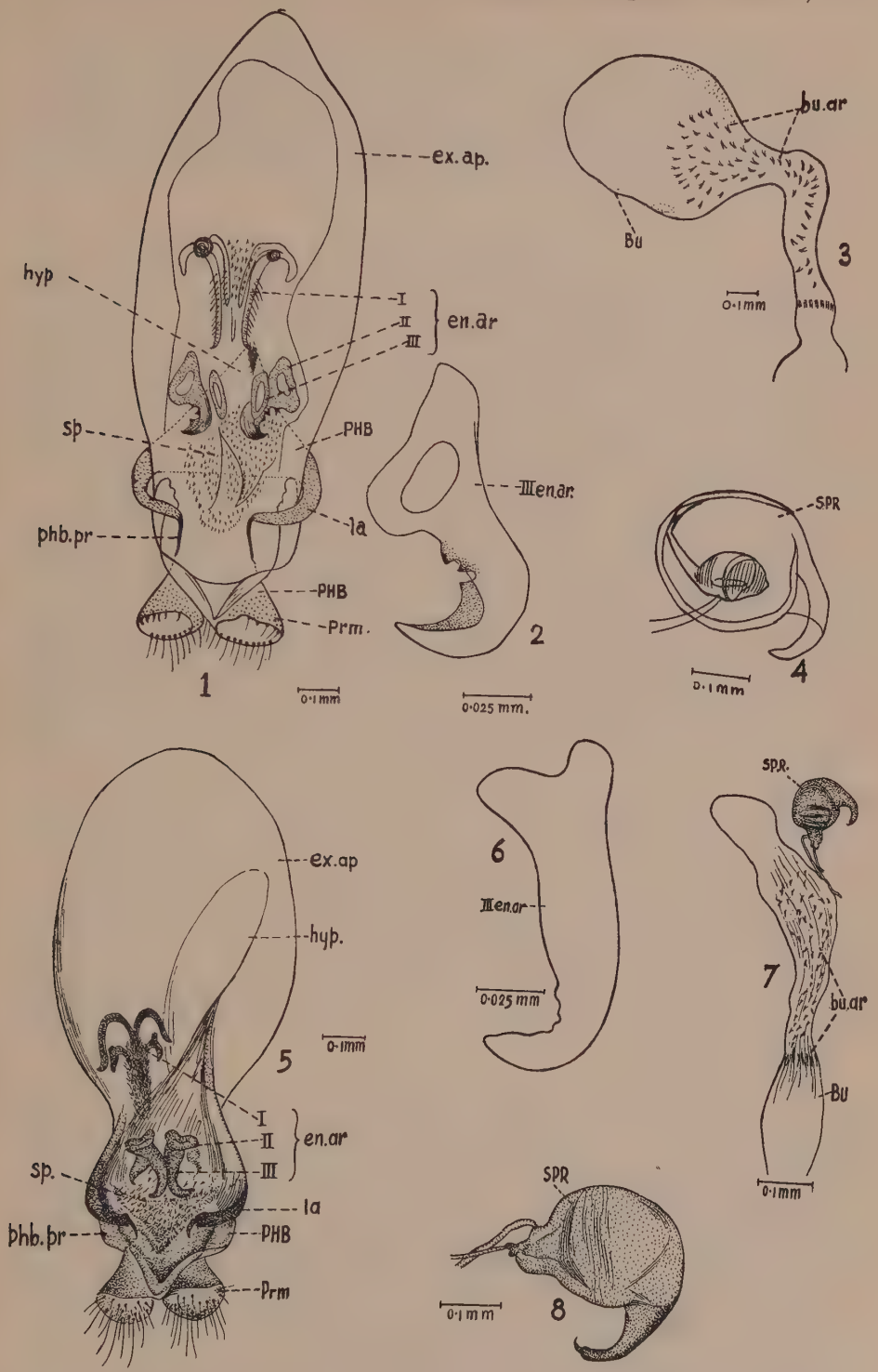
Figs. 1–4.—*Caryedon gonager* (Fabricius). (1) Male genitalia. (2) Endophallic armature of male genitalia. (3) Bursa copulatrix. (4) Spermatheca.

Figs. 5–8.—*Caryedon fuscus* (Goeze). (5) Male genitalia. (6) Endophallic armature of male genitalia. (7) Bursa copulatrix. (8) Spermatheca.

Bu., Bursa copulatrix ; *bu. ar.*, armature of the bursa copulatrix ; *en. ar.*, endophallic armature ; *ex. ap.*, exophallic apodeme ; *hyp.*, hypomere ; *la.*, lateral arch of phallobase ; *PHB.*, phallobase ; *Phb. pr.*, process of the phallobase ; *Prm.*, paramere ; *sp.*, spines ; *SPR.*, spermatheca.



Caryedon gonager (Fabricius) and *C. fuscus* (Goeze). For explanation see facing page.

Bu) is elongate, but in *C. gonager* its apex is bulb-like. The armatures within the bursa (*bu. ar*) are, however, identical in both species. The spermatheca in *C. fuscus* differs slightly from that of *C. gonager*; in the former the beak terminates in a very thin membranous structure in the form of a capillary tube.

The bursa copulatrix and spermatheca of *C. languidus* show considerable differences from those of *C. fuscus*.

Conclusion.

The comparative studies described above lead the present authors to conclude that Bridwell's contention that they are all the same species is not tenable. It is felt that *Caryedon languidus* (Gyllenhal) should, on the evidence of differences in genital structures, be considered as a distinct species. In *C. gonager* (Fabricius) these structures do not differ so greatly from those of *C. fuscus*. Nevertheless, the slight differences justify treating it as a subspecies.

The assignment of the above species to the genus *Caryedon*, in which the authors have followed Bridwell (1929), is purely tentative. *Caryedon* has been erected with *Bruchus serratus* Oliver as its type, though, on the strength of synonymy not definitely established, Bridwell had concluded that *Caryedon fuscus* (Goeze) should be designated as the type of this genus. The genital structure of *Bruchus serratus* has never been studied. In view of the differences in genitalia noted in this paper, the present authors feel that similar differences may be observed between *B. serratus* and *C. fuscus*. The type species of *Caryedon* should, therefore, remain *B. serratus* Oliver until such time as synonymy is also confirmed on genitalic grounds. Should the genitalia of *B. serratus* show significant differences of generic value from the types discussed in this paper, the species dealt with here may require a new generic name.

Acknowledgments.

The authors are indebted to Dr. E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi, for enabling this investigation to be undertaken and for encouragement during the work.

Grateful thanks are expressed to Dr. R. W. Howe, Pest Infestation Laboratory, Slough, Bucks., England, for specimens of *Caryedon fuscus*, without which the work could not have been carried out.

Thanks are also due to Shri W. M. Hindlekar, Division of Entomology, Indian Agricultural Research Institute, New Delhi, for preparing the Camera Lucida drawings reproduced here.

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TWO NEW GENERA AND SPECIES OF APHIDIDAE FROM JAPAN (HOMOPTERA).

By Ryoichi Takahashi.
(*Kuroyama, Osaka-fu, Japan*).

[Communicated by Dr. W. J. Hall].

The aphid fauna of Japan has been studied by a number of entomologists, but many species are still undescribed or little known. In the present paper two new species are described, each of which represents a new genus. The material upon which this paper is based is preserved in the author's collection.

Tsugaphis gen. n.

Apterous viviparous female.—Body depressed and flattened, without wax pores, with some minute pointed setae. Head and thoracic segments entirely fused; abdomen separated from cephalothorax, but all the segments consolidated. Head without frontal median protuberance and antennal tubercles. Eyes of 3 facets, submarginal. Antennae short, concealed under body, distant from the margin, 4-segmented, without secondary sensoria; distal part of last segment small, primary sensoria surrounded by a rim. Rostrum stout, 5-segmented, the ultimate segment short, stout. Legs short, concealed under body, with a few pointed setae; trochanters fused with femur, tibiae without spinules and stout setae; tarsi with 2 or 3 setae on basal segment, and with simple pointed setae on distal segment; empodial setae fine, slightly capitate or blunt at tip. Cornicles wanting. Cauda constricted basally and globular, concealed under body, distinctly removed from its hind end. Anal plate bilobed. Genital plate small. Mesosternal apophyses short, widely separated. Abdominal spiracles 7 on each side, the anterior 2 widely separated.

Type species: *Tsugaphis sorini* sp. n.

This aphid seems to belong in the subfamily Hormaphidinae on the basis of the structure of the rostrum, cauda, anal plate and legs, but the phylogenetic relationships are not clear at present. The new genus is distinct in the tegmosis[1] of the body segments and differs from the aleyrodiform females of other genera in the eighth abdominal segment being consolidated with the remaining part of the abdomen.

Tsugaphis sorini sp. n.

Apterous viviparous female.—Body, antennae and legs pale greenish in life, eyes black, cauda pale, anal plate slightly pale brownish. Body elliptical, about 1·4 times as long as wide, broadest at base of abdomen, depressed, not sclerotised, without wax pores and tubercles. Cephalothorax a little shorter than abdomen, sometimes slightly emarginate at anterior end; abdomen with no trace of segments. Dorsum corrugated over entire surface with minute circular pores in transverse rows, 4 in each row; these may be the bases of minute setae, which are not distinguishable. Eyes distinctly removed from body margin. Antennae short, stout, directed laterally, not reaching beyond body margin, distant from frontal margin, distinctly longer than the distance between them, not imbri-

[1] The fusion or consolidation of two or more body segments in Arthropoda.—*Ed.*

cated, scarcely with setae; segment II a little longer than wide, somewhat narrowed towards the base with 2 minute pointed setae; segment III about three times as long as wide, a little shorter than IV, with 1 or 2 minute setae, and with an apical sensorium much smaller than facet of eye and surrounded by a rim; segment IV distinctly shorter than fore tibia, but longer than tarsus, sometimes with a few minute spinules in rows, with 3 apical setae; a pair of minute ventral setae between the antennae. Legs short, with a

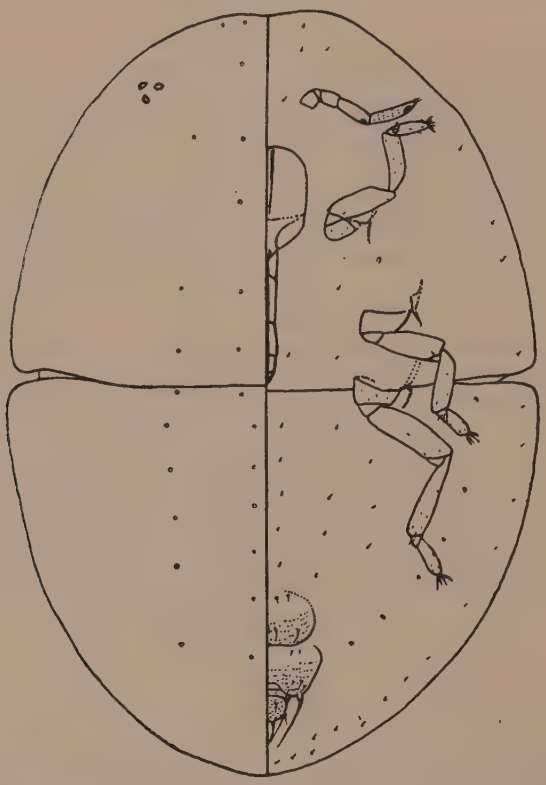


Fig. 1.—*Tsugaphis sorini* sp. n. Apterous viviparous female.

few minute setae; femora rather stout, tibiae rather stout, as long as the femur, which has no minute spinules or stout setae; tarsi not imbricated, without spinules, with 3 setae on basal segment in fore and middle legs, but 2 setae on basal segment in hind pair, and with a few short pointed setae on distal segment; empodial setae very slightly capitate or blunt apically. Rostrum variable in length, sometimes reaching hind margin of thorax, stout, blunt at tip, without granulations; the ultimate segment small, but distinctly defined, wider than long; the penultimate segment short; rostral setae minute. Spiracles normal in number, abdominal spiracles semilunar. Cauda wider than long, distinctly constricted basally with a pair of short setae on upperside and 2 pairs of large marginal setae, these marginal setae each arising from a small but distinct tubercle, and the mesal 2 longer; a pair of prominent divergent apodemes arising from cauda. Anal plate distinctly bilobed, each lobe much wider than long, rounded, nearly as wide as cauda, with 2 large setae, which reach far beyond the cauda, each arising from a distinct tubercle. Rudimentary gonapophyses not discernible, but 4 minute setae present near the base of anal plate. Genital plate small, not darker, with spinules and about 7–9 small setae. Ventral setae

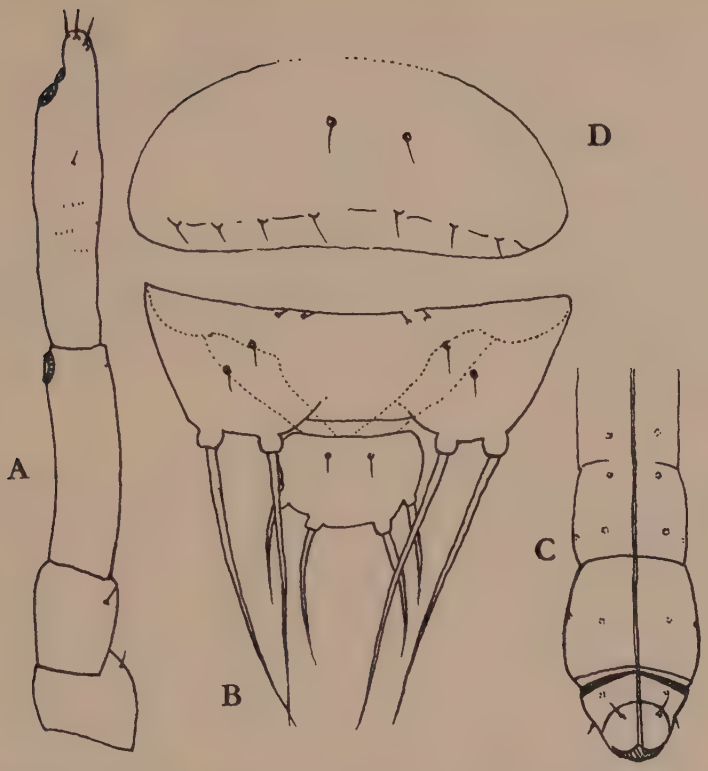


FIG. 2.—*Tsugaphis sorini* sp. n. Apterous viviparous female. (A) Antenna. (B) Anal plate and cauda. (C) Rostrum. (D) Genital plate.

minute, in rows on mid region, almost in a row on submarginal area. Mesosternal apophyses short, widely separated from each other. Body length about 0·85–0·9 mm.

Host plant: *Tsuga sieboldii*, on the undersides of leaves.

Holotype and several paratypes, JAPAN: Odai-ga-hara (1500 m.), Nara Prefecture, 15.viii.1956 (*M. Sorin, R. Takahashi*).

Platyaphis gen. n.

Apterous viviparous female.—Body depressed, without wax pores, with some minute pointed setae. Head fused with prothorax; meso- and metathoraces and all abdominal segments fused, but mesothorax distinctly separated from prothorax; thoracic and first 7 abdominal segments each produced laterally into a distinct pointed lobe, which is provided with a pointed seta at tip; abdominal tergite VIII produced and pointed posteriorly. Head very broad in front, without median frontal protuberance and antennal tubercles, with a deep lateral marginal indentation, in which eye is located. Eyes rather small, protuberant, without triommatidion. Antennae short, concealed under head, arising mesad of eye, 4-segmented, wanting secondary sensoria, with scarcely any setae; primary sensorium on segment III appearing to be deeply sunken; processus terminalis a little shorter than basal part of IV. Rostrum very short, 3-segmented. Legs concealed under

body, fore and middle legs short, trochanters not distinct from femur ; tibiae with minute spinules, but wanting stout setae at apex ; tarsi with 2 setae on basal segment, and some pointed setae on distal segment ; empodial setae membranaceous. Cornicles rudimentary, represented by minute rings. Cauda small, short, rounded, concealed under the body, far removed from hind end. Anal plate not indented. Genital plate small. Spiracles small, subcircular, 7 on each side of abdomen, the anterior 2 widely separated. Sternal apophyses of mesothorax wanting.

Type species : *Platyaphis fagi* sp. n.

This genus seems to be related to *Dasyaphis* Takahashi,[2] with which *Sinocallis* Tseng and Tao may be identical, rather than to other proposed genera, but differs from it chiefly in the following characters: abdominal tergite VIII not separated from the preceding segment ; thoracic and abdominal segments produced laterally ; cauda and anal plate concealed under the body ; anal plate short, not divided.

Platyaphis fagi sp. n.

Apterous viviparous female.—Green, antennae and legs pale greenish. Body broadly ovate, broadest at anterior part of abdomen, narrower cephalad, a little longer than wide, depressed. Thoracic and abdominal segments I–VII produced laterally into bluntly pointed lobes and with a short simple seta at the tip, minutely and irregularly serrate at outer margin ; abdomen with indistinct traces of segmentation on dorsum. Dorsum not sclerotised, corrugated, without granulations and tubercles, with many rounded low dermal protuberances in the suture between the prothorax and mesothorax ; some minute pointed setae present on cephalo-prothorax, 4 similar setae on each of abdominal segments I–V, a similar submarginal seta on meso- and metathoraces on each side ; abdominal tergite VIII with a pair of minute setae near hind end. Head very broadly rounded and with 3 pairs of small setae at frontal margin. Eyes rather small, globular, protuberant, without triommatidion, with many facets which are equal in size. Antennae somewhat shorter than distance between them, directed laterally, reaching slightly beyond body margin, rather narrow, not imbricated, wanting spinules, but with some long longitudinal corrugations on segment III, with scarcely any setae ; segment III shorter than fore femur, a little longer than IV, with a rather small indistinct subapical sensorium, which appears to be deeply sunken ; segment IV distinctly narrower than III, with 2 short apical setae and a rather small indistinct sensorium, the basal part longer than processus terminalis. Rostrum very short, smaller than clypeus, nearly as long as, or a little longer than wide, not reaching hind margin of prothorax, distinctly 3-segmented, stout, bluntly pointed; basal 2 segments subequal in length, the distal a little longer, with 4 pairs of setae ; granulations wanting on rostrum. Legs entirely concealed under body, fore femora a little longer than tibia, with a few minute setae ; tibiae with minute spinules, fore tibiae somewhat longer than antennal segment III ; hind legs distinctly longer, with a row of long fine setae on tibia, these setae longer than width of tibia ; tarsi with 2 long slender setae on basal segment, and about 6 long pointed setae on distal segment ; empodial setae membranaceous, much expanded towards apex, broadly rounded at distal margin, longer than wide. Cornicles minute, hardly visible. Cauda small, short, rounded, not constricted at base, located under anterior part of abdominal tergite VIII, with about 5 short setae. Anal plate very short, not indented, with 4 short setae. Genital plate small, with some indistinct spinules and about 6 short setae. Rudimentary gonapophyses not distinct, 2 in number, each represented by 2 short setae. Abdominal spiracles small, subcircular. Venter with some minute pointed setae, 2 or 3 pairs of similar setae on last abdominal segment, 2 similar setae on each lobe of penultimate abdominal segment, and with numerous granulations in

[2] 1938, *Tenthredo* 2 : 13.

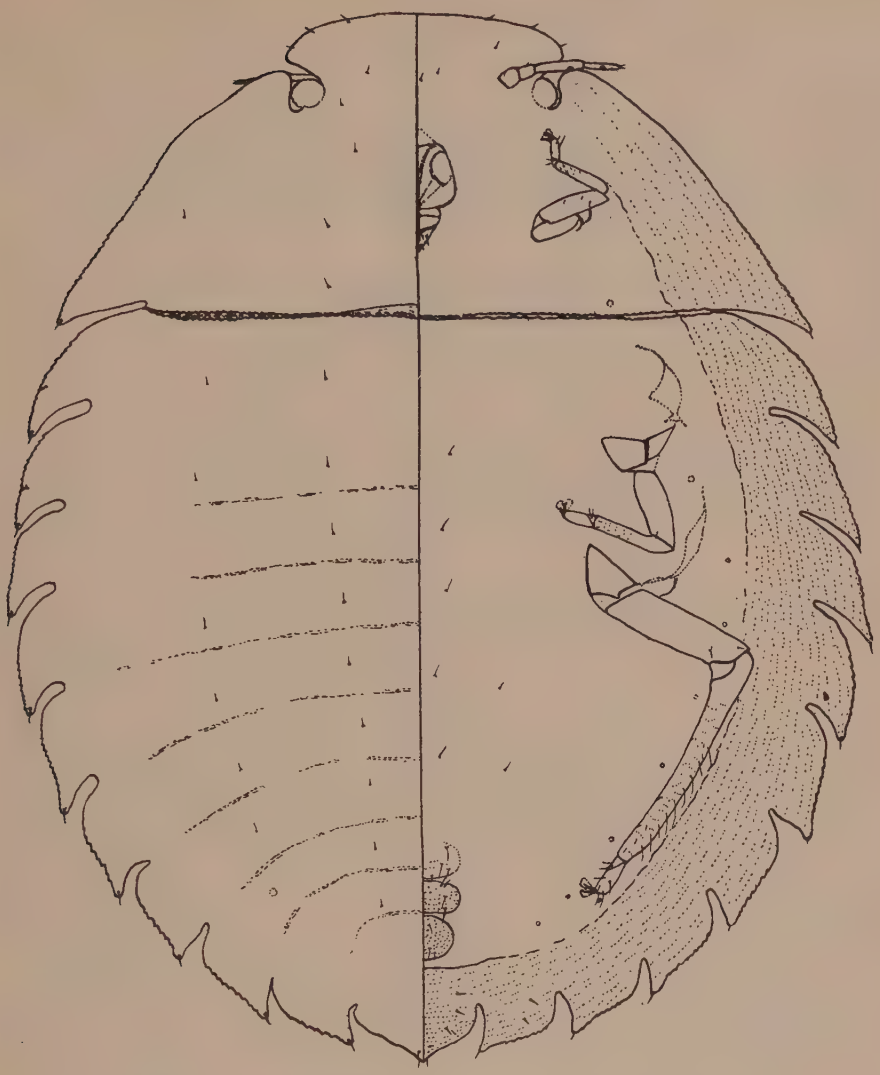


FIG. 3.—*Platyaphis fagi* sp. n. Apterous viviparous female.

rows on marginal lobes of thorax and abdomen. Sternal apophyses wanting between the legs. Body length 1·8–2·0 mm.

Young larva.—Body segments not fused. Head slightly produced anteriorly beyond bases of antennae, straight at frontal margin, with 4 minute dorsal setae between the eyes, a pair of similar setae between antennae, and with 2 pairs of longer setae at frontal margin. Eyes marginal, not protuberant, with about 20 facets of equal size. Antennae arising from margin, much larger than those of adult, 4-segmented, imbricated, with a few rather long fine setae. Legs with minute spinules and some very long setae on the tibia; tarsi with 4 setae on basal segment, and a pair of very long capitate setae near apex of distal segment. Thoracic and abdominal segments I–VII produced laterally into a lobe on each side as in the adult, but the lobe not serrate at the margin; abdominal segment VIII with a distinct

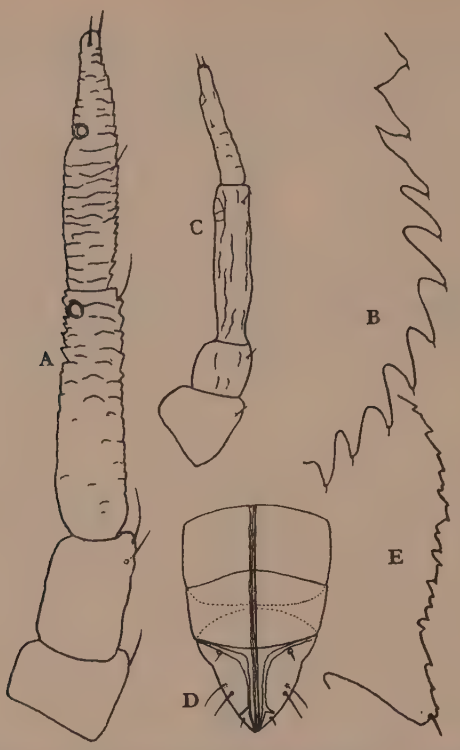


FIG. 4.—*Platyaphis fagi* sp. n. (A) Antenna of young larva. (B) Thoracic and abdominal marginal lobes of young larva. (C) Antenna of apterous viviparous female (adult). (D) Rostrum of apterous viviparous female (adult). (E) Lateral lobe of apterous viviparous female (adult).

process at the hind end. Cornicles represented by small distinct rings. Other characters almost similar to the adult.

Host plant : *Fagus crenata*, on the undersides of foliage, along the midrib.

Holotype and several paratypes, JAPAN : Kongo-san, Osaka Prefecture, 2.ix.1956 (*M. Sorin*).

TAXONOMIC NOTES ON THE GENERA *SPIDIA* BUTLER AND *HEMICTENARCHA* WARREN (LEPIDOPTERA: DREPANIDAE), WITH A DESCRIPTION OF A NEW SUBSPECIES FROM MT. RUWENZORI.

By Allan Watson.

(*British Museum (Natural History)*).

[Communicated by D. S. Fletcher].

This paper was written in order to name a new race of *Spidia fenestrata* Butler which was found on Mt. Ruwenzori by Mr. D. S. Fletcher during the British Ruwenzori Expedition of 1952. The opportunity has also been taken, however, to redescribe the other races of this species and to clarify some of the nomenclature.

Text figures of the male genitalia of each of the races of *S. fenestrata* Butler and of the female genitalia of the nominate race have been prepared. The scale placed by each text figure or group of figures represents one millimetre. All drawings are of a ventral view.

Measurements have been recorded in the following form : (*a*) mean wing-span (twice distance between apex of fore wing and centre of thorax), (*b*) range of measurements of wing-span, and (*c*) number of specimens measured.

Type specimens are in the British Museum (Natural History) unless otherwise stated. All type material has been located and examined.

The following gentlemen kindly arranged loans of material through their respective institutions : Dr. H. Hannemann, Zoologisches Museum der Humboldt Universität, Berlin ; Dr. R. Malaise, Naturhistoriska Riksmuseum, Stockholm.

I should like to thank Mr. D. K. Mugford for his practical assistance.

Spidia Butler.

Spidia Butler, 1878, *Ann. Mag. nat. Hist.* (5) **2** : 460. Type by monotypy and original designation *Spidia fenestrata* Butler.

Hemictenarcha Warren, 1898, *Novit. zool.* **5** : 221. Type by monotypy *Hemictenarcha rubrisecta* Warren. **Syn. nov.**

The species *Spidia excentrica* Strand (Strand, 1912, *Arch. Naturgesch.* Suppl. **1** : 122) was listed under two generic names by Gaede (Gaede, 1931, *Lepid. Cat.* **49** : 51 and 52), namely *Spidia* Butler and *Phalacrothyris* Warren. Although there are many similarities between these genera which after further study may justify the sinking of *Phalacrothyris* Warren as a synonym of *Spidia* Butler, *Spidia excentrica* Strand must be placed in the former genus as follows : *Phalacrothyris excentrica* (Strand).

Spidia fenestrata fenestrata Butler.

Spidia fenestrata Butler, 1878, *Ann. Mag. nat. Hist.* (5) **2** : 460.
Spidia fenestrata Butler, Gaede, 1927, *in* Seitz, *Gross-Schmett. Erde* **14** : 289.
Spidia fenestrata Butler, Gaede, 1931, *Lepid. Cat.* **49** : 51.
Spidia fenestriculata Gaede, 1914, *Int. ent. Z.* **8** : 65.
Spidia fenestrata (var.) *fenestriculata* Gaede, Gaede, 1927, *in* Seitz, *Gross-Schmett. Erde* **14** : 289. (Good plate).
Spidia fenestrata var. *fenestriculata* Gaede, Gaede, 1931, *Lepid. Cat.* **49** : 51.

Type.—Holotype ♀, Old Calabar.

Male.—40·2, 35·4–43·6 mm. (20). Palp slender, extending to anterior margin of labrum ; pale yellow or pale brown irrorated with dark brown on outer surface. Proboscis small, approximately equal in length to diameter of eye ; concealed between eyes. Antenna unipectinate and plumose from base to apex, longest antennal pectination approximately equal to greatest diameter of eye ; colour of upperside of shaft as for ground colour of

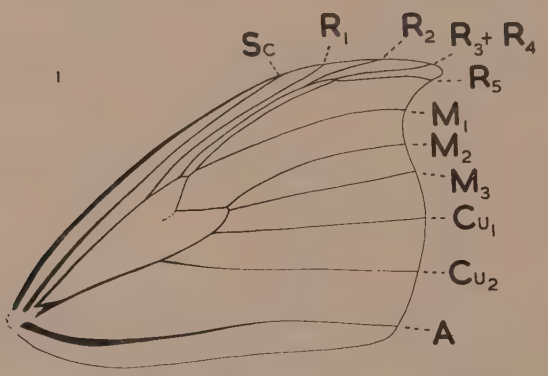


Fig. 1.—*Spidia fenestrata fenestrata* Butler. Venation of fore wing.

upperside of fore wing. Front of head narrow, eyes nearly touching each other at labrum ; brown in colour, darkest immediately anterior to antennae ; posterior part of head as for colour of upperside of fore wings.

Thorax similar in colour to adjacent surface of fore wing. Meso- and metathoracic tibia with single pair of subequal apical spurs, and with glabrous, dark brown, longitudinal sulcus along whole of side opposite tibial spurs. Legs similar in colour to underside of wings, but with outer surface of prothoracic leg slightly darker.

Costal margin of fore wing moderately convex ; apex strongly falcate ; outer margin moderately convex ; inner margin nearly straight. Venation as in figure 1. Ground colour of upperside of wing variable : pale yellow ; pale green ; reddish-brown ; dark brown ; bright yellow suffused with reddish-brown (as in holotype of *S. fenestrata divisa* Auriv.) ; usually speckled with dark brown ; slightly lustrous. Fore wing usually with small mid-cell spot ; usually with semi-transparent patch of erect, lustrous, colourless scales enclosed by posterodistal angle of cell, and similar patch between M_2 and M_3, M_3 and Cu_1, Cu_1 and Cu_2, and sometimes between M_1 and M_2 ; oblique dark brown line from apex to one-third inner margin edged distally with pale brown, yellowish-brown, or yellow ; sometimes with trace of postmedial and terminal fascia ; fringe of outer margin slightly darker than ground colour of wing, darkest anteriorly ; apex of wing usually irrorated with brown.

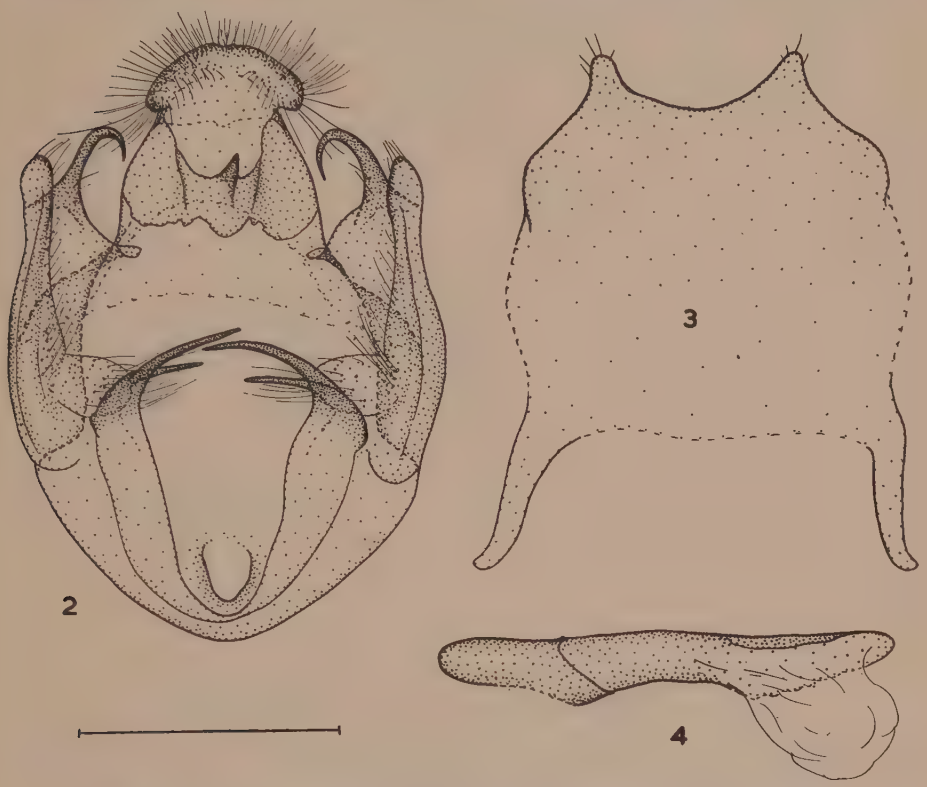
Outer margin of hind wing evenly convex ; short oblique line at base of wing continuous with oblique line of fore wing ; ground colour variable ; small posterodistal spot (*see* Watson,

1957, *Bull. Brit. Mus.* (*nat. Hist.*) (*Ent.*) **4** : 412) ; sometimes with trace of broad postmedial and subterminal fascia.

Underside of both wings slightly more lustrous than upperside ; usually yellow, yellowish-brown, or pale brown, and heavily speckled with dark brown. Trace of oblique line usually present on fore wing ; semi-transparent patches strongly edged with dark brown. Hind wing sometimes with trace of postmedial fascia. Frenulum absent.

Coloration of abdomen doubtful.

Male genitalia (figs. 2–4) : Tegumen and vinculum well developed ; saccus small and shallow, not produced anteriorly. Valve bifurcate apically, with hairy, ovoid patch on



FIGS. 2–4.—*Spidia fenestrata fenestrata* Butler. Male. (2) Male genitalia ; (3) eighth abdominal sternite ; (4) aedeagus.

inner surface at base. Strongly sclerotised, two-pronged structure medial to base of each valve, its base fused with anterior part of vinculum. Juxta small. Gnathus with single, posteriorly directed, pointed, medial process. Uncus hairy, hood-like. Aedeagus (fig. 4) with unornamented vesica. Eighth tergite subquadrate ; anterior margin slightly concave, posterior margin weakly emarginate medially. Eighth sternite (fig. 3) bilobed posteriorly.

Female.—46·2, 45·0–47·6 mm. (4) : Similar to male, but larger, and with longest antennal pectination equal to about two-thirds greatest diameter of eye.

Female genitalia (fig. 5) : Bursa copulatrix with pair of invaginate spinose signa ; ductus bursae membranous except near ostium. Broad sclerotised plate posterior to ostium. Ostial segment well sclerotised, deeply sulcate dorsomedially ; anterior apo-

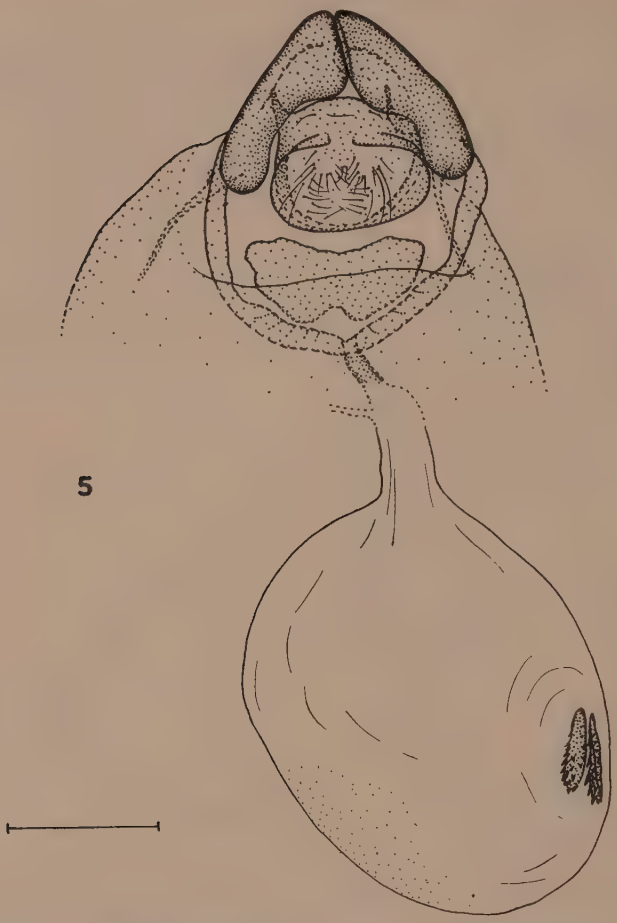


Fig. 5.—*Spidia fenestrata fenestrata* Butler. Female genitalia.

physes moderately long. Pre-ostial segment (?) forming cylindrical ring round ovipositor lobes; posterior apophyses short. Ovipositor lobes small.

Material examined.—British Museum (Nat. Hist.). Sierra Leone: 1 ♂, Moyamba (*D. Cator*). Gold Coast: 1 ♂, Sekendi; 1 ♂, Prestea; 1 ♂, Kumasi (*J. D. J. Sanders*). S. Nigeria: 2 ♂, Ilesha (*L. E. H. Humfrey*); 2 ♀, Lagos distr., in forest 1½ miles east of Oni, 12.x.1910 (*W. A. Lambourn*); 2 ♀, Warri, x.1897 (*Dr. Roth*); ♀ holotype and 1 ♂, Old Calabar. French Equatorial Africa: 9 ♂, 1 ♀, S. Cameroons, Bitje, Ja River, 2000 feet, 4 ♂ taken in wet season in Oct.–Nov., and 1 ♂, 1 ♀ in dry season, 1882–1915 (3 ♂, 1 ♀ coll. by *G. L. Bates*). Angola: 1 ♂, Pungo Andongo, 9.iv.1875; 1 ♀, Canhoca (*Dr.* Ansorge).

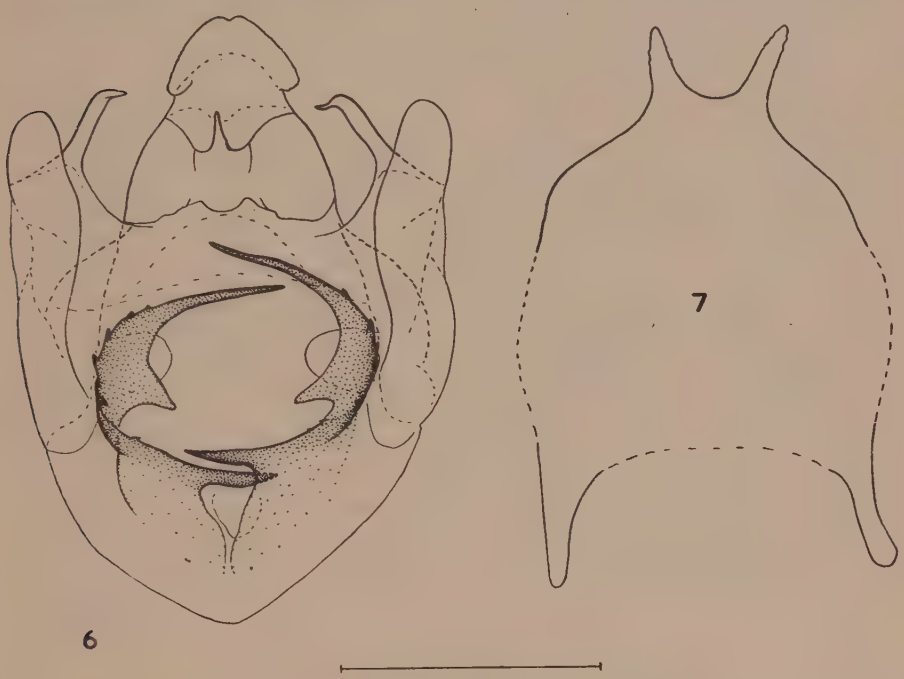
Zoologisches Museum der Humboldt Universität, Berlin. Nigeria: 1 ♀, Brit. Kamerun, Mamfe (*Mansfeld*); 1 ♀ (holotype of *S. fenestriculata* Gaede), S. Nigeria, Opobo (*Schültze*).

Spidia fenestrata divisa Aurivillius **comb. nov.**

Spidia divisa Aurivillius, 1906, *Ark. Zool.* **3** (1) : 10. (Good colour plate).
Spidia divisa Aurivillius, Gaede, 1927, *in* Seitz, *Gross-Schmett. Erde* **14** : 289.
Spidia divisa Aurivillius, Gaede, 1931, *Lepid. Cat.* **49** : 51.

Type.—Holotype male, Congo, Mukimbungu (near Luozi, W. Belgian Congo). In Naturhistoriska Riksmuseum, Stockholm.

Male.—42·2, 41·0–43·6 mm. (2) Very similar to the nominate race. Holotype with semi-transparent patches only between M_2 and M_3, and between M_3 and Cu_1 (as in some specimens of nominate race); colour of upperside as in colour plate referred to above.



FIGS. 6–7.—*Spidia fenestrata divisa* Aurivillius. (6) Male genitalia; (7) eighth abdominal sternite.

(A similar pattern is also found in the nominate race). The other specimen is similar to the type but without reddish suffusion on upperside of hind wing and with only faint trace of distal transverse fasciae.

Male genitalia (figs. 6–7): As for nominate race but with structure at base of each valve quite different in shape, and with posterior processes of eighth sternite (fig. 7) longer and closer to medial line.

Female.—Not known.

Distribution.—The holotype of this race was collected near the mouth of the River Congo which, superficially at least, seems to be in the middle of the range of the nominate race. There is, however, no evidence to indicate sympatry between the two forms at this locality, and they have therefore been treated as races of a single species.

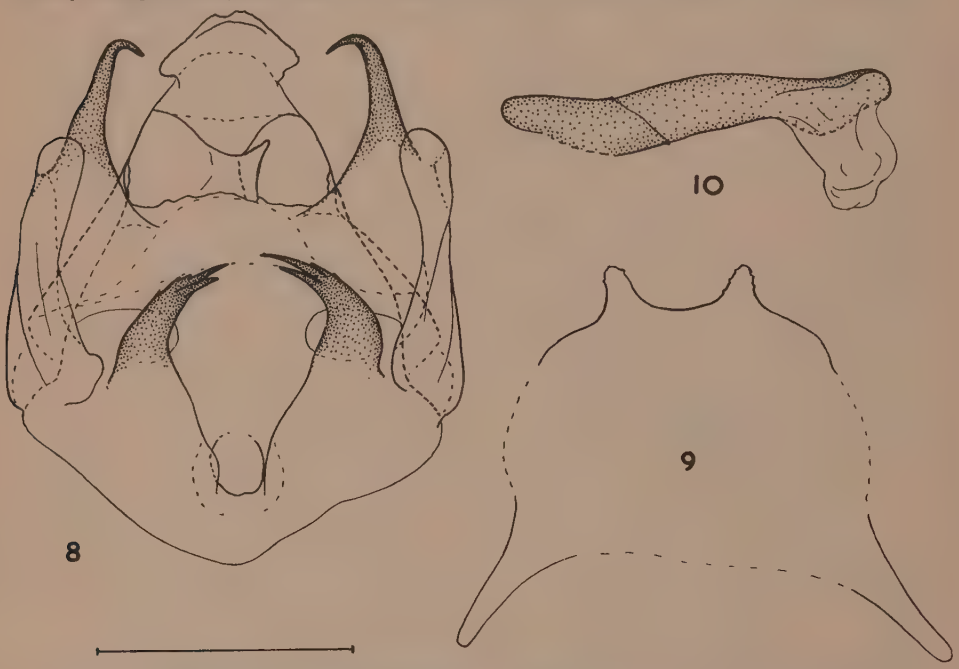
Material examined.—Naturhistoriska Riksmuseum, Stockholm. Belgian Congo : ♀ holotype.

British Museum (Nat. Hist.). Uganda : 1 ♂, Katera (this is about 60 miles NW. of Kampala) (*G. W. Jeffery*).

Spidia fenestrata goniata ssp. n.

Type.—Holotype male, Uganda, Ruwenzori Range, Nyinabitaba, 8650 feet, 7–13.vii.1952 (*D. S. Fletcher*).

Male.—47·4, 45·4–48·4 mm. (2). As for nominate race but with following differences : Longest antennal pectination equal to about twice greatest diameter of eye. Vein R_2 of fore wing arises from short distance distal to $R_{5+}M_1$, not from cell. Costal margin nearly straight except at base and apex. Ground colour of upperside of wings brown



Figs. 8–10.—*Spidia fenestrata goniata* ssp. n. Male holotype. (8) Male genitalia ; (9) eighth abdominal sternite ; (10) aedeagus.

(both specimens) ; trace of distal transverse fascia in both fore and hind wings, with anterior part of antemedial fascia of fore wing quite strongly marked. Outer margin of fore wing more strongly convex. Outer margin of hind wing weakly angled at middle. Underside of wings slightly paler than upperside.

Male genitalia (figs. 8–10) : Valve differently proportioned. Structure at base of each valve distinctively shaped, not two-pronged. Aedeagus differently shaped apically (fig. 10). Eighth sternite shorter anteroposteriorly ; posterior processes closer to medial line (fig. 9).

Female.—Not known.

Material examined.—British Museum (Nat. Hist.). Uganda : Holotype ♂ ; 1 ♂ paratype, Ruwenzori Range, Mobuku Valley, 7800 feet, 29–31.xii.1934 (*F. W. Edwards*).

A REVISION OF THE GENUS *TROPIDONOTACRIS* CHOPARD, 1954 (ORTHOPTERA : TETTIGONIIDAE).

By D. R. Ragge.

(*British Museum* (*Natural History*)).

This East African genus was erected for the single species *Tropidonotacris carinata* Chopard, 1954, the female sex of which is still unknown. Specimens of two further species have been found amongst the Orthoptera accessions of the British Museum (Natural History), and in one case females are included. *Tropidonotacris* Chopard belongs to the Phaneropterinae, and is unique in the subfamily in possessing a strongly developed median carina along the vertex and pronotum.

In the descriptions the wing-vein nomenclature is that of Ragge (1955). The terms " dorsal ", " ventral ", " internal " and " external ", as applied to the spines and spurs of the legs, are used on the assumption that the legs are extended horizontally, the fore legs forwards and the other two pairs backwards. In counting the dorsal spines of the hind tibiae every size is included. The descriptions of coloration are intended to apply to fresh or unfaded specimens ; although the general coloration is probably always green in this genus, dried specimens will frequently be brown due to *post mortem* colour changes. Regarding the measurements given, for help with which I am indebted to Miss P. M. Stock, the expression " total length " refers to the distance from the most anterior part of the head to the tips of the flexed wings. The measurement given for the ovipositor is the distance from its apex to the tip of the subgenital plate. The pronotal length and vertical width of the hind femur were measured with a screw micrometer eyepiece ; the remaining measurements were all made with vernier callipers. All measurements are given in millimetres, and in each case the number of specimens measured is given in parenthesis.

Tropidonotacris Chopard, 1954.

Tropidonotacris Chopard, Chopard and Kevan, 1954, Orthoptera-Ensifera from Northern Kenya and Jubaland. *Trans. R. ent. Soc. Lond.* **105** : 321.

Type species : *Tropidonotacris carinata* Chopard, 1954.

Diagnosis.—Vertex and pronotum with strongly developed median carina. Fastigium of vertex compressed, produced forwards beyond fastigium of frons. Lateral pronotal lobes with more or less distinct angle in anteroventral region of margin, not clearly distinguishable from disc. Fore coxae unarmed. Fore tibiae with oval tympanic opening on both sides. Abdomen with median carina except at apex.

Discussion.—This genus is easily recognised by the ridged vertex and pronotum. The fore wings are broad and have a rather irregular venation. The genitalia of both sexes are of a simple type : the ovipositor is large and robust and the male cerci are relatively unspecialised. The male cerci and subgenital plate provide the only important characters in distinguishing between the species. In all the species so far known there are ventral spinules on the distal part of the hind femora.

Distribution.—*Tropidonotacris* Chopard is found throughout the drier parts of East Africa.

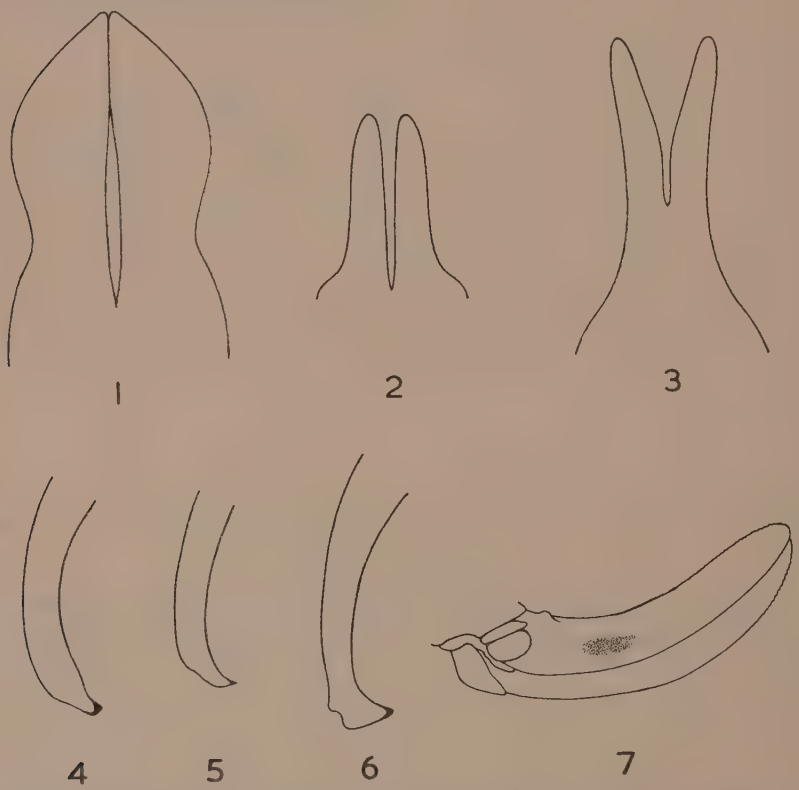
Key to the Species.

As the female is known in one species only, this key refers solely to males.

1 Lobes of the subgenital plate broad, contiguous towards the apex, as in figure 1 . . . . . **T. carinata** Chopard
– Lobes of the subgenital plate relatively narrow, not contiguous, as in figures 2 and 3 2
2 Total length more than 41 mm. Cerci as in figure 6, when viewed from above . . . . . **T. grandis** sp. n.
– Total length more than 41 mm. Cerci as in figure 5, when viewed from above . . . . . **T. amabilis** sp. n.

Tropidonotacris carinata Chopard, 1954.

Tropidonotacris carinatus [sic] Chopard, Chopard and Kevan, 1954, Orthoptera-Ensifera from Northern Kenya and Jubaland. *Trans. R. ent. Soc. Lond.* **105** : 322. Holotype ♂, Kenya : Mandera distr., Takabba, 3° 25′ N., 40° 12′ E., thorn-bush, 11.xii.1944 (*Kevan*). In the British Museum (Natural History).



Figs. 1–7.—*Tropidonotacris* Chopard. (1) Ventral view of the male subgenital plate of *T. carinata* Chopard. (2) The same of *T. amabilis* sp. n. (3) The same of *T. grandis* sp. n. (4) Dorsal view of the left male cercus of *T. carinata* Chopard. (5) The same of *T. amabilis* sp. n. (6) The same of *T. grandis* sp. n. (7) Lateral view of the ovipositor of *T. amabilis* sp. n.

Diagnosis.—Male : Lobes of subgenital plate broad, contiguous towards apex, as in figure 1. Cerci as in figure 4, when viewed from above.

Female : Unknown.

Measurements.

Males.—Total length (5) : 37·6–43·8, mean 39·82 ; median length of pronotum (5) : 4·7–5·5, mean 5·12 ; length of hind femur (2) : 18·0–19·1, mean 18·55 ; maximum vertical width of hind femur (2) : 2·0–2·1, mean 2·05 ; length of fore wing (5) : 29·6–32·3, mean 30·94 ; of exposed part of hind wing (3) : 3·3–4·2, mean 3·90.

Discussion.—The broad, partially contiguous lobes of the male subgenital plate distinguish *T. carinata* Chopard from the other two species of the genus, between which it is intermediate in size.

Material examined.—♂ holotype.

Kenya : Wajir distr., El Katulo, 2° 28′ N., 40° 38′ E., desert grass and thorn-bush, 16.vi.1944 (*Kevan*) (3 ♂) ; Mandera distr., Banissa, 3° 58′ N., 40° 20′ E., thorn-bush, 10.xii.1944 (*Kevan*) (1 ♂).

All in the British Museum (Natural History).

Distribution.—This species is so far known only from the semi-desert area of North-East and East Kenya.

Tropidonotacris amabilis sp. n.

Holotype ♂, Ethiopia : Ual Ual, 19.xi.1953 (*Bellehu*). In the British Museum (Natural History).

Diagnosis.—Male : Subgenital plate as in figure 2. Cerci as in figure 5, when viewed from above.

Female : Ovipositor as in figure 7.

Description.—Male : Fastigium of vertex compressed, produced forwards slightly beyond fastigium of frons.

Fore tibiae with about 6–8 external spurs, including two apical ones. Mid tibiae with about 9–13 external spurs. Hind femora with about 6–18 ventral spinules in distal part. Hind tibiae with about 35–50 external dorsal spines. *R* of fore wings with 3–4 posterior branches. Hind wings extending beyond fore wings by about one-seventh length of latter.

Supra-anal plate triangular (often invisible in dried specimens, due to shrinkage). Cerci as in figure 5, when viewed from above, with a subapical ventrolateral callosity. Subgenital plate as in figure 2.

Coloration green, often with few dark brown spots on fore wings. Femoral spinules and tibial spines and spurs dark-tipped. Hind wings hyaline, exposed part translucent. Cerci with dark tips.

Female : As male, except for wings and genitalia. Fore wings with very indistinct venation, about half as broad as long. Hind wings not extending beyond fore wings. Ovipositor as in figure 7, with dark brown spot on each side.

Measurements.

	Males.	*Females.*
Total length . . .	(20) : 31·2–39·3, mean 33·60	(3) : 24·3–25·9, mean 25·23
Median length of pronotum	(19) : 3·5–4·7, mean 4·20	(3) : 5·1–5·6, mean 5·40
Length of hind femur .	(16) : 15·9–19·6, mean 17·92	(3) : 18·6–19·3, mean 18·83
Maximum vertical width of hind femur . .	(18) : 1·8–2·2, mean 1·97	(3) : 2·6–2·8, mean 2·64
Length of fore wing . .	(21) : 23·7–30·7, mean 27·45	(3) : 19·2–20·5, mean 19·87
Length of exposed part of hind wing . . .	(17) : 2·7–4·4, mean 3·69	—
Length of ovipositor . .	—	(3) : 10·3–10·8, mean 10·53

Variation.—The spurs of the fore and mid tibiae and the ventral spinules of the hind femora vary in number, and there is considerable variation in the number of hind tibial spines. The venation of the fore wings is rather variable.

Material examined.—♂ holotype; 5 ♂ paratypes, same data as holotype; 1 ♀ paratype, Ethiopia: Ual Ual, 10.xii.1953 (*Bellehu*); 5 ♂ paratypes, Ethiopia: Ogaden, Wardere, 24.xi.1953 (*Popov*); 5 ♂ paratypes, Ethiopia: Gherlogubi, 1.xi.1953 (*Bellehu*); 1 ♂ paratype, Ethiopia: Ogaden, nr. Scallare, 23.xi.1953 (*Popov*); 1 ♂ paratype, Ethiopia: Wardere, 7–9.xi.1952 (*Stephenson*); 1 ♀ paratype, Ethiopia: El Rago, 26.xi.1953 (*Popov*); 1 ♀ paratype, Ethiopia: El Rago, 8.xii.1953 (*Popov*).

Kenya: Turkana, Lodwar to Lokitaung, 1–15.v.1954 (*Popov*) (1 ♂); Turkana, 1934 (*Buxton*) (2 ♂).

All in the British Museum (Natural History).

Distribution.—The known range of this species is confined to southern Ethiopia and northern Kenya. It doubtless also occurs in Somalia and British Somaliland.

Tropidonotacris grandis sp. n.

Holotype ♂, Tanganyika: Little Mahenge, 10.v.1923 (*Miller*). In the British Museum (Natural History).

Diagnosis.—Male: Large, total length more than 41 mm. Subgenital plate as in figure 3. Cerci as in figure 6, when viewed from above.

Female: Unknown.

Description.—Male: Fastigium of vertex compressed, produced forwards well beyond fastigium of frons.

Fore tibiae with about 11 external spurs, including 2 apical ones. Mid tibiae with about 13–14 external spurs. Hind femora with about 14 ventral spinules in distal part. Hind tibiae with about 45 external dorsal spines. *R* of fore wings with 3 posterior branches. Hind wings extending beyond fore wings by about one-seventh length of latter.

Supra-anal plate triangular. Cerci as in figure 6, when viewed from above, depressed apically. Subgenital plate as in figure 3.

Coloration green. Femoral spinules and tibial spines and spurs dark-tipped. Hind wings hyaline, exposed part translucent. Cerci with dark tip.

Female: Unknown.

Measurements.

Male.—Total length: 48·0; median length of pronotum: 6·1; length of hind femur: 24·0; maximum vertical width of hind femur: 2·2; length of fore wing: 36·4; of exposed part of hind wing: 5·5.

Discussion.—This species is easily diagnosed by its genitalia.

Material examined.—The holotype is unique.

Reference.

Ragge, D. R., 1955, *The wing-venation of the Orthoptera Saltatoria.* London, British Museum (Natural History).

A NEW SPECIES OF *PHANEROPTERA* SERVILLE FROM FORMOSA (ORTHOPTERA : TETTIGONIIDAE).

By D. R. Ragge.

(*British Museum (Natural History)*).

In a recent revision of the genus *Phaneroptera* Serville (Ragge, 1956) the author listed three female specimens from Formosa (then on loan from the Naturhistorisches Museum, Vienna, through the courtesy of Dr. M. Beier) as possible representatives of the species *Ph. falcata* (Poda). The record was marked with a query as female specimens of the genus from this part of the world cannot be diagnosed satisfactorily, and these three specimens showed slight deviations from the typical form of *Ph. falcata* (Poda).

During a visit to Vienna in June, 1956, the author found several further specimens of the same series amongst unidentified material in the Naturhistorisches Museum. These specimens included one male, and it became clear that the species was an undescribed one. In the same month a visit was made to the Deutsches Entomologisches Institut, Berlin, through the kindness of Dr. G. Petersen ; two males and two females of the same species were found there in the Sauter Collection, identified by Karny as " *Ph. nigro-antennata* Brunner ". In this way a total of three males and 11 females has come to light and a description of the species has been made practicable.

It was at first thought possible that these specimens were of *Ph. nakanoensis* Matsumura and Shiraki, a species of which no type material was available for the revision mentioned above. This species was, however, synonymised by Furukawa (1937) with *Ph. nigro-antennata* Brunner, and Dr. S. Asahina has kindly informed me by letter that, in establishing this synonymy, Dr. Furukawa examined the type specimens of the former species. As Dr. Furukawa's paper is entirely in Japanese, it is perhaps worth quoting here the synonymy of *Ph. nigro-antennata* Brunner.

Phaneroptera nigro-antennata Brunner, 1878.

Phaneroptera nigro-antennata Brunner, 1878, *Monographie der Phaneropteriden* : 215. Holotype ♂, Japan. In the Zoologisches Museum of the Humboldt-Universität, Berlin.
Phaneroptera nakanoensis Matsumura and Shiraki, 1908, *J. Coll. Agric. Tokyo* 3 : 22. 1 ♂ cotype and 1 ♀ cotype, Japan : Tokyo, vii. In the collection of S. Matsumura.

Dr. Asahina has very kindly sent me Japanese specimens of both sexes of *Ph. nigro-antennata* Brunner and *Ph. falcata* (Poda) which were all collected and identified by Dr. Furukawa. Having examined the holotype of *Ph. nigro-antennata* Brunner, the present writer can confirm Dr. Furukawa's identification of this species, and thus the synonymy established by this author is put on a firm footing.

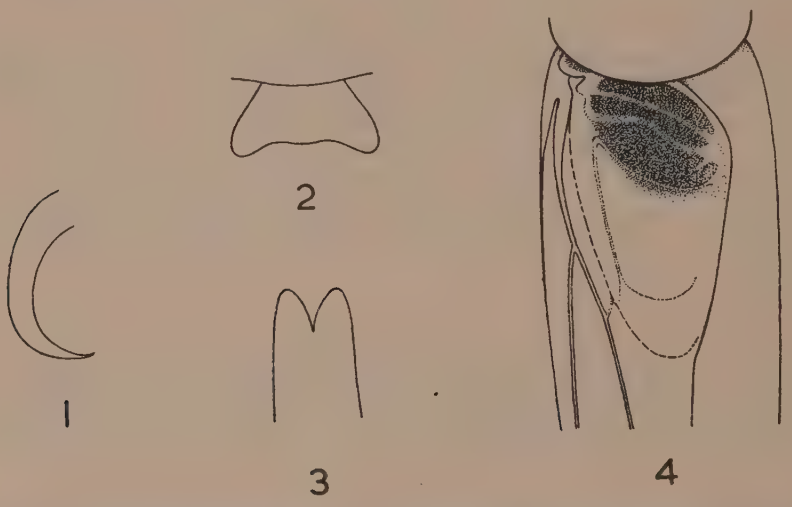
In the description given below the wing-vein nomenclature is that of Ragge (1955). The terms " dorsal ", " ventral ", " internal " and " external ", as applied to the spines and spurs of the legs, are used on the assumption that the legs are extended horizontally, the fore legs forwards and the other two pairs backwards. In counting the dorsal spines of the hind tibiae every size is included. Regarding the measurements, for help with which I am indebted to Miss P. M. Stock, the expression " total length " refers to the distance from the most anterior part of the head to the tips of the flexed hind wings. The measurement given for the ovipositor is the distance from its apex to the tip of the subgenital plate. The pronotal length, length of the fore tibia, vertical width of the hind femur, and length of the ovipositor, were measured with a screw micrometer eyepiece ; the remaining measurements were all made with vernier callipers. In each case the number of specimens measured is given in parenthesis.

Phaneroptera trigonia sp. n.

Holotype ♂, FORMOSA : Takao, 11.viii.1907 (*Sauter*). In the Naturhistorisches Museum, Vienna.

Diagnosis.—Male : Supra-anal plate very broad, as in figure 2, showing tendency to form 3 posterior angles. Cerci as in figure 1. Subgenital plate as in figure 3. Antennae dark brown except near base. Left fore wing with large dark basal mark in region of Cu_2, as in figure 4.

Female : Very similar to *Ph. falcata* (Poda), but antennae dark brown except near base and fore femora more than 6 mm. in length. Also very similar to *Ph. nigro-antennata* Brunner, but rather larger and without dark hands along disc of pronotum and posterior part of fore wings.



FIGS. 1–4.—*Phaneroptera trigonia* sp. n. (1) Dorsal view of the left male cercus. (2) Dorsal view of the male supra-anal plate. (3) Ventral view of the male subgenital plate. (4) Dorsal view of the stridulatory organ.

Description.—Male : Fastigium of vertex fairly strongly compressed, sulcate above, concave in profile, not raised at apex.

Pronotum without lateral carinae or feebly subcarinate. Spine of fore coxae well-developed. Fore tibiae with about 5–6 external spurs, including 2 apical ones. Mid tibiae with about 11–13 external spurs. Hind femora unarmed. Hind tibiae with about 70–100 external dorsal spines and 3 apical spurs on each side. Fore wings with distinct bifurcate or occasionally three-branched R_s, which is free from MA. Hind wings extending beyond fore wings by between third and half length of latter.

Tenth abdominal tergite unmodified. Supra-anal plate very broad, as in figure 2, showing tendency to form 3 posterior angles. Cerci as in figure 1. Subgenital plate as in figure 3.

Coloration green, usually with dark brown markings on vertex and dark brown spots on pronotum, femora, and abdominal tergites. Antennae dark brown except near base. Tibial spines and spurs black or black-tipped. Cells of fore wings and exposed part of hind wings brown. Left fore wing with large dark basal mark in region of Cu_2, as in figure 4. Hind wings hyaline except for exposed part. Cerci with darkened tip.

Female : As male except for genitalia and fore wing bases. Ovipositor crenulate along most of dorsal margin and along distal extremity of ventral margin ; dorsal margin often rather sharply angled near base.

Measurements (in millimetres).

	Males.	*Females.*
Total length . . .	(3) : 29·0–31·4, mean 30·33	(4) : 34·9–38·8, mean 36·70
Median length of pronotum	(2) : 3·5–3·6, mean 3·55	(4) : 4·0–4·1, mean 4·04
Length of fore femur .	(3) : 6·2–6·6, mean 6·33	(4) : 6·5–7·6, mean 7·05
Length of hind femur .	(2) : 21·1–22·4, mean 21·75	(4) : 23·3–25·4, mean 24·20
Maximum vertical width of hind femur . . .	(2) : 1·7–1·9, mean 1·80	(4) : 2·2–2·3, mean 2·22
Length of fore wing . .	(3) : 17·7–18·6, mean 18·00	(4) : 21·7-24·8, mean 22·85
Length of exposed part of hind wing . . .	(3) : 7·6–8·9, mean 8·07	(4) : 8·9–9·5, mean 9·18
Length of ovipositor . .	—	(4) : 5·3–5·4, mean 5·37

Variation.—The spurs of the fore and mid tibiae vary in number and there is great variation in the number of hind tibial spines.

Discussion.—This species is quite closely allied to *Ph. nigro-antennata* Brunner and *Ph. falcata* (Poda), which probably also occur on Formosa. The male may be distinguished from the latter species by its genitalia, and from *Ph. nigro-antennata* Brunner (which has rather similar genitalia) by its much narrower stridulatory organ. The male genitalia also prevent any confusion with *Ph. gracilis* Burmeister, another Formosan species.

To distinguish the female is a matter of greater difficulty. This sex may, however, be separated from *Ph. nigro-antennata* Brunner by the longer fore femora, and from *Ph. falcata* (Poda) by the dark brown antennae. *Ph. trigonia* sp. n. has a less attenuate form than *Ph. gracilis* Burmeister, the hind femur in particular being appreciably thicker.

The distinguishing features which characterise these four species (which are either known to or likely to occur on Formosa) are summarised in the keys given below. Satisfactory determinations cannot be made in the absence of males and the key to females is intended to be merely suggestive.

Males.

1 Subgenital plate very broad with spreading lobes (Ragge, 1956, fig. 39) **Ph. falcata** (Poda)
– Subgenital plate comparatively slender (fig. 3; Ragge, 1956, figs. 38 and 41) 2
2 Cerci very long, widening subapically before suddenly tapering to a point (Ragge, 1956, fig. 22) . . . . . **Ph. gracilis** Burmeister
– Cerci comparatively short, not widening subapically (fig. 1; Ragge, 1956, fig. 25) 3
3 Stridulatory organ almost as broad as long (Ragge, 1956, fig. 86) **Ph. nigro-antennata** Brunner
– Stridulatory organ much longer than broad (fig. 4) . . **Ph. trigonia** sp. n.

Females.

1 Fore wings with a dark band along the posterior margin 2
– Fore wings unicolorous 3
2 Lateral pronotal lobes longer than deep . . . . **Ph. gracilis** Burmeister
– Lateral pronotal lobes at least as deep as long **Ph. nigro-antennata** Brunner
3 Antennae dark brown except near base 4
– Antennae pale coloured 5
4 Maximum vertical width of hind femur more than 2 mm. **Ph. trigonia** sp. n.
– Maximum vertical width of hind femur less than 2 mm. **Ph. gracilis** Burmeister
5 Lateral pronotal lobes longer than deep . . . . **Ph. gracilis** Burmeister
– Lateral pronotal lobes about as deep as long . . . . **Pb. falcata** (Poda)

Material examined.—♂ holotype; 1 ♀ paratype, Formosa: Takao, 17.viii.1907 (*Sauter*) (Nat. Mus. Vienna); 8 ♀ paratypes, Formosa: Takao (*Sauter*) (2 in Brit. Mus. (Nat. Hist.), 6 in Nat. Mus. Vienna); 2 ♂ paratypes, Formosa: Kankau, Koshun, vii.1912 (*Sauter*) (Deutsches Ent. Inst. Berlin); 1 ♀ paratype, Formosa: Kankau, Koshun, iv.1912 (*Sauter*) (Deutsches Ent. Inst. Berlin); 1 ♀ paratype, Formosa: Kankau, Koshun, v.1912 (*Sauter*) (Deutsches Ent. Inst. Berlin).

Distribution.—Known only from Formosa.

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DESCRIPTION OF A NEW SPECIES OF *GRYPIDIUS* SCHÖNHERR (COL.: CURCULIONIDAE) WITH A KEY TO THE GENUS.

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[Communicated by J. W. H. Lawson].

General Observations on the Genus *Grypidius* Schönherr.

Grypidius is one of the few genera of the tribe Erirrhinini represented in Britain. The superficially similar genus, *Grypidiopsis* Champ., which is found in Central America, can readily be distinguished by the presence of a well-defined tooth on the anterior femur.

Zumpt (1929), followed by Klima (1934), attempted to revive the generic name *Grypus* Grm., 1817, in place of *Grypidius* Schön., 1826. As the latter name has been used by every other writer since 1826 and, according to Hustache (1930) Germar's *Grypus* is a *nomen nudum*, I see no reason for following Zumpt in this.

In Junk, *Coleopterorum Catologus* Pars 140, *Grypidius* has five species listed—*atrirostris* F., *brunnirostris* F., *equiseti* F., *mannerheimi* Faust, and *vittatus* Cooper. Zumpt (1935) gives a key to separate the first four and another species, *rugicollis* Voss, which had been described in 1935. Zumpt writes of *atrirostris*, " It resembles *equiseti* in shape and size but the scales of the dorsal surface are small and not so crowded. The setae are somewhat longer and more numerous. It can be distinguished from *equiseti* at a glance by the reddish-brown scales of the elytral protuberances ". (My translation). I could not on these criteria or any others distinguish *equiseti* from the single specimen in the British Museum and the four in the Armitage collection (Glasgow University) labelled *atrirostris*. There seemed to be no less crowding of the scales nor any difference in their size when compared with the 60 or so specimens of *equiseti* in the British Museum collection which varied considerably in colour. Tournier (1874) describes *atrirostris* as a variety of *equiseti*. Uyttenboogaart (1943) is also of the opinion that *atrirostris* is a form of *equiseti*, not a separate species.

Neither *atrirostris* nor *vittatus* have been included in the key which I have drawn up. Of the latter Leconte (1876) wrote " a Canadian specimen was sent me by Mr. Cooper which I determined simply as *Grypidius* n. sp. ?, but by some confusion of the labels in describing the species to which I had given no definite names, he has given the name *G. vittatus* to a small species of *Sitones* apparently *S. tibialis* of Europe, which occurs in Canada and in Hudson Bay territory, perhaps imported, perhaps indigenous ".

The British Museum collection contained two *Grypidius* species which could not be identified with Zumpt's key. One of these, represented by a single specimen only, I have referred to in the key as *Sp. X*. Further specimens of the second species were obtained from the California Academy of Sciences by courtesy of Mr. Hugh B. Leech. As I have been unable to find any described species to which they could be attributed, the species is described as new below.

Grypidius leechi sp. n.

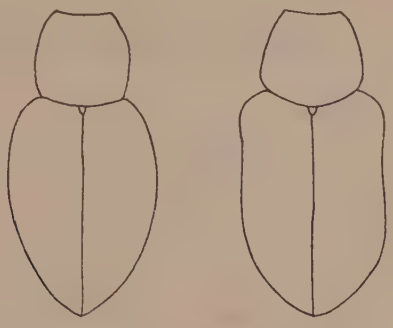
Female.—Derm reddish-brown to brownish-black with light golden brown and yellowish scales. Head clothed with narrow golden scales. Rostrum bare, curved, finely punctured, with a median dorsal keel, about as long as the head and prothorax together. Antennal insertions slightly nearer the apex than the base of the rostrum with scrobes extending to the anterior margin of the eye. Basal segment of funicle three times and second segment

Fig. 1.—*Grypidius leechi* sp. n. Female.

twice, as long as broad ; remaining five segments approximately as broad as long. Antennal club oval and compact, the first segment as long as the other segments together. Prothorax narrower at the apex than the base. Dorsum closely punctured except for a rather distinct band at the anterior edge and a less distinct longitudinal band running back from it towards, but not reaching, the base. These punctures much larger than those on the head and elytra and many of them, especially at the sides, covered by large yellowish or light brown feathery-looking scales. More slender hair-like scales present both on the pronotum and elytra. Scutellum with a dense covering of scales—abraded in some specimens. Elytra twice as long as broad, almost parallel for the anterior two-thirds, then narrowing to the apex. Shoulders well marked. Striae rather deep and interstices fairly flat and covered with golden-brown scales. An indistinct patch of lighter scales present in the middle of interstice three. Legs dark reddish-brown with hair-like scales. Length 5·0–6·0 mm. (excluding rostrum).

U.S.A.: Colorado, Wyoming. Canada : Alberta, 10 ♀.

The holotype and seven paratypes are in the collection of the California Academy of Sciences where they had been identified as *G. brunnirostris* ; the other two paratypes in the British Museum (Nat. Hist.).



2 3

Figs. 2–3.—Pronotum and elytra of (2) *Grypidius mannerheimi* ; (3) *G. leechi*.

Key to the Species of the Genus *Grypidius*

1 All interstices of elytra flat 2
Interstices of elytra with tuberosities, or alternate ones raised . . . 3

2 Elytra evenly widened from the shoulders, which are not well marked, to just behind the middle (fig. 2).

Body blackish-brown. Vertex of head with a few slender scales. Prothorax subglobose, pronotum dull and closely punctured. Elytra granulate and dull, covered with an indefinite pattern of dark brown and yellow scales and also with yellow hair-like scales. Length 5·0–6·0 *mm. Japan, Siberia*

G. mannerheimi Faust

Elytra more or less parallel for anterior two-thirds and not widened posteriorly ; the shoulders well marked (fig. 3).

Body blackish-brown. Vertex of head with numerous broader scales. Prothorax broader at the base, pronotum with larger and less crowded punctures than mannerheimi, *rather shiny especially on a central longitudinal impunctate band. Elytra more shiny in appearance than* mannerheimi, *with ochreous scales and hair-like scales. Length* 5·0–6·0 *mm. U.S.A., Canada*

G. leechi sp. n.

3 Prothorax broadest in the anterior half 4
Prothorax not broadest in the anterior half 5

4 Body blackish-brown, covered with various shades of brown scales and short recumbent pubescence. Every interstice of the elytra, except the first, with large low tuberosities.

Pronotum narrowed like a collar in front, and tapering behind ; dorsal surface coarsely wrinkled, with a narrow abbreviated central callosity. Length 7·0 *mm. China* . . . . . **G. rugicollis** Voss[1]

Body rich reddish-brown with narrow black scales, and with broad yellowish ones at the sides and posteriorly. Third, fifth and seventh interstices unevenly raised.

[1] See end of key.

Pronotum with the sides evenly curved; densely punctured except for a narrow band at the anterior edge; no trace of a central callosity. Length 5·0 *mm. Siberia* . . . . . *Sp. X*

5 Interstices 3, 5 and 7 weakly raised and without tuberosities

Body dark brown. Upper surface densely covered with unicoloured ochreous scales. Length 3·5–4·5 *mm. Europe and North America*
G. brunnirostris Fabricius

Interstices 3, 5 and 7 with marked protuberances.

Body blackish-brown. Upper surface with scales of two colours. Length 5·0–7·0 *mm. Europe, Siberia, North America*. 6

6 Upper surface with black and white scales. . . . **G. equiseti** Fabricius
Upper surface with dark brown and grey scales
G. equiseti var. **atrirostris** Fabricius

[1] This species was not seen. The characters used have been taken from a translation of Voss's description of the species.

Summary.

Some notes on the naming of the genus *Grypidius* Schönherr are followed by a revised key to its species and the description of one new species, *Grypidius leechi*.

Acknowledgments.

This work was carried out while I was in receipt of a grant from the Department of Scientific and Industrial Research. I wish to thank Mr. R. A. Crowson for the great assistance he has given me throughout. I would also like to thank Mr. P. Belton for his assistance with the drawing of *G. leechi*, Mr. H. B. Leech for lending me the *Grypidius* material belonging to the California Academy of Sciences, the Dresden Museum for lending me a specimen of *G. mannerheimi* and finally the British Museum (Nat. Hist.) for allowing me to study their representatives of the genus.

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FURTHER NOTES ON THE SYSTEMATICS OF THE *ANOPHELES LEUCOSPHYRUS* GROUP (DIPTERA: CULICIDAE).

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In a recent publication (Colless, 1956), to which the present paper forms a supplement, a general review was given of the systematics and biology of *Anopheles* " *leucosphyrus* "; i.e. the *A. leucosphyrus* species group. A major, and taxonomically quite distinct, member of the group, *A. leucosphyrus balabacensis*, was there awarded subspecific rank only, in view of its apparently allopatric distribution with regard to the type form, and the occurrence in Malaya of populations of a rather intermediate nature. These latter suggested the existence there of a zone of secondary integration between the two subspecies, and they were described under vernacular names as the " Fraser's Hill form " and the " Kepong form ". However, in a footnote (Colless, *op. cit.*: 64), reference was made to recently acquired specimens which throw additional light on the status of the " Kepong form ". Other collections have since been received, and it is the purpose of this paper to describe what appears to be the true situation, as revealed by this new material.

These recent collections comprise : (*a*) Three series of wild-caught females from jungle catches at Ulu Gombak, near Kuala Lumpur ; (*b*) four series of adults, with correlated larval and pupal pelts, bred from eggs laid by single females from the same catches as (*a*) above ; and (*c*) five series of adults, many with correlated larval and pupal pelts, reared from larval collections from around Kuala Lumpur and from Padang Besar, near the Thai border. For all these excellent series of specimens, I am deeply indebted to Lt.-Col. R. Traub of the U.S. Army Medical Research Unit, and Dr. J. A. Reid and Mr. Ganipathipillai of the Institute for Medical Research. I have also seen several useful series in the collections of the London School of Hygiene and Tropical Medicine and the British Museum (Natural History).

The first and most obvious fact revealed by these collections is the occurrence in Central Malaya of mixed populations of the " Kepong form " and *A. leucosphyrus leucosphyrus* (collections (*a*) and (*b*) above), in which there is no evidence whatsoever of morphological intergradation, every specimen being immediately recognisable as belonging to one or the other form—in collection (*a*), 20 specimens clearly belonged to the type form and 13 to the " Kepong form ". The differences, moreover, involve a number of characters—in adult, larva, and pupa—and there is no suggestion of a balanced polymorphism, operating within a single species. This is to say, the morphological differences and sympatric occurrence show that the two forms belong to two different species.

Furthermore, in collection (*b*), the progeny raised from two females of *A. l. leucosphyrus* (33 and 29 adults respectively) and from two females of the " Kepong form " (25 and 13 adults) all bred true to their parent form in all characters, in all stages. Also, there is no indication of any abnormal degree

of variability in the " Kepong form ", such as might be expected were hybridisation actually occurring. For instance, a sensitive differentiating character is the ratio of the lengths of pupal spines IV.A/III.A. Statistical analysis of various non-sibling series gave the following coefficients of variation (ratio of standard deviation to mean) :—

A. l. leucosphyrus,	Borneo, 10 specimens	23%
,, ,,	Malaya, 8 specimens	33%
A. l. balabacensis,	Borneo, 11 specimens	24%
,, ,,	Malaya, 9 specimens	14%
" Fraser's Hill form ",	10 specimens	18%
" Kepong form ",	22 specimens	26%

The variable magnitude of these coefficients reflects nothing more than the number of batches from which the specimens were drawn, and the " Kepong form " and " Fraser's Hill form " show no sign of being intrinsically more variable than the others.

It is thus clear that the " Kepong form " is not a hybrid population, but genetically fixed and distinct, and the question arises to which species it should be allocated. As already noted (Colless, *op. cit.*), it bears marked resemblances to *A. l. balabacensis* in the key-characters for adult, larva, and pupa, and appears to be the Central Malayan representative of that form. I propose, therefore, to elevate *balabacensis* to specific rank and to treat the " Kepong form " as one of its subspecies. The specific rank of *balabacensis* is necessitated by the sympatric distribution of its terminal subspecies with the type form.

The recognition of *balabacensis* as a full species again raises the question of the necessity for further subspecific splitting, in the light of the geographic variation previously described (Colless, *op. cit.*). There is, in particular, the broad cleavage into forms, from the Asiatic mainland (excluding Central Malaya) and those from the Malaysian islands, based on several characters of the wing and the relative length of palp segments. However, since these differences are relatively slight—they would not fit within the " 70 per cent. rule " of Mayr *et al.* (1953)—and since field workers would certainly not welcome further additions to the nomenclature, I see no necessity for any formal recognition of this subdivision.

There remains, however, the question of the three other variant forms, referred to as the " Negros ", " Luzon " and " Fraser's Hill " forms (Colless, *op. cit.*). Of these, the " Negros form " is known only from a few specimens, and, although probably worthy of subspecific rank, analysis of further material would be required before any formal recognition could be granted. This applies also to the " Fraser's Hill form ", which may be a distinct altitudinal subspecies or species, or a phenotypic variant produced by growth at high altitudes. The " Luzon form ", however, has a number of very distinctive characters which clearly separate it from all others and, despite the few specimens available, I propose now to award it formal recognition.

Subspecific status would appear to be appropriate for this form, but there is some difficulty in choosing the species to which it should be allocated. Its larva is virtually identical with that of *balabacensis*, but the pupa closely resembles that of *leucosphyrus*. Also, the adult, although clearly separated from all other forms

by its pharyngeal teeth alone, tends to resemble *leucosphyrus* in its maxillary index, reduced tarsal banding, etc., but the same trend is found in the " Kepong form " of *A. balabacensis*. To add to the confusion, the key-character (the presector dark spot on wing vein 1) shows considerable variation, some specimens resembling *leucosphyrus* and some *balabacensis*. However, if geographical distribution is taken into account, it seems more logical to regard the " Luzon form " as derived from *A. balabacensis* (or, more probably, an undifferentiated parent stock), in parallel with *A. leucosphyrus*, which itself shows signs of having only recently become specifically distinct. I propose, therefore, formal recognition of the " Luzon form " as *A. balabacensis baisasi*, named in honour of Mr. F. E. Baisas, of the Philippine Department of Health.

As regards *A. balabacensis*, I have seen further specimens from near the Thai border (series (*c*) above) which agree with the form previously noted from that area, except that two variant females have the wing vein 1 with an abnormally long presector dark mark, resembling the condition typical of *A. l. leucosphyrus*. In all other characters, these specimens were typical of *A. balabacensis*. I have also seen several series from Taiwan (three larvae, three females, two males) in the collections of the London School of Hygiene and Tropical Medicine and the British Museum. These were all typical *A. balabacensis* except that, in the one specimen mounted, the maxillary index was abnormally high (16·0). There was no marked resemblance to the Philippine forms, except perhaps in the larvae, which had the palmate hairs very weakly developed on the metathorax and abdominal segment II.

Formal diagnoses of these new subspecies are given below, with a general outline of diagnostic characters for the *leucosphyrus-balabacensis* complex. Descriptions of the " Fraser's Hill form " and " Negros form ", illustrations and full details of synonymy, are given in my previous paper (Colless, *op. cit.*). No reference is here made to the males, which in general resemble the females, but with a greater degree of variability which makes their identification of doubtful value. Quantitative data are summarised in Tables I–III.

A. leucosphyrus Dönitz, 1901.

Dönitz, W., 1901, *Insektenbörse* **18** : 37.

Type locality : Sumatra : Kajoe Tanam.

Type: Co-type female in the British Museum (Natural History).

Adult female.

Wing with presector dark mark of vein 1 subdivided by pale spots (usually 3 or more) extending to, or almost to, the base of the vein ; at least to the level of the base of the humeral dark mark of the costa. (Accessory sector pale spot usually extending to the costa on at least one wing ; maxillary index about 17 ; pharyngeal teeth averaging about 15 in number ; hind tarsal segment IV usually without any distinct basal pale band).

Larva.

Basal tubercles of the inner and central shoulder hairs usually not fused, that of the inner hair without any prominent apical tooth or spine. (Abdominal hair I.9 usually with 5 or more branches ; hair IV.13 usually with 4 or more branches on both sides and about half as long as adjacent hair 12).

TABLE I.—*Adult characters:* A. leucosphyrus *and* A. balabacensis.

Form.	Number of specimens.	Ratios of palp segs. 3/4.	Ratios of palp segs. 3/5.	Number of phar. teeth.	Maxillary index.	[1]Presector dark mark, vein 1.	[2]Access. sect. pale spot, costa.	[2]Basal hind tarsal seg. IV.
A. leucosphyrus:								
Borneo	10	1·6–1·8	2·2–2·9	13–16	14–19	+++	14/16	1/16
		1·69	*2·60*	*14·7*	*16·9*			
Malaya	10	1·6–1·8	2·2–2·9	14–17	15–18	+++	65/72	14/63
		1·69	*2·59*	*15·6*	*16·7*			
Sumatra	1	1·65	2·38	?	?	+++	9/14	0/10
Overall	21	1·6–1·8	2·2–2·9	13–17	14–19	+++	88/102	15/89
		1·69	*2·59*	*15·2*	*16·8*			
A. b. balabacensis:								
N. Malaya	4	1·6–1·8	2·3–2·5	13–15	12–14	+, ++	0/12	12/12
		1·68	*2·35*	*14·0*	*13·0*			
Assam	3	1·5–1·6	2·2–2·4	14–15	13–15	+, ++	0/13	8/8
		1·52	*2·28*	*14·7*	*14·0*			
Burma	5	1·5–1·6	2·2–2·5	13–15	11–16	+, ++	0/12	12/12
		1·55	*2·33*	*13·6*	*13·0*			
[3]Asiatic mainland, miscell.	1	1·59	2·50	?	?	+, ++	0/9	9/9
Taiwan	1	1·65	2·52	16	11·5	+, =	0/4	4/4
Balabac	—	.	.	.	.	++	1/5	5/5
Borneo	10	1·6–1·9	2·4–2·9	12–15	11–15	=	61/100	100/100
		1·73	*2·65*	*13·7*	*13·2*			
Java	3	1·7–1·9	2·7–3·3	12–12	13–15	++	5/8	8/8
		1·80	*2·93*	*12·0*	*14·0*			
A. b. introlatus	14	1·4–1·8	2·3–3·0	12–19	15–18	+, =	47/56	13/53
		1·60	*2·50*	*15·9*	*16·9*			
A. b. baisasi	2	1·6–1·6	2·5–2·7	10–10	16–18	+, ++, +++	0/5	0/5
		1·60	*2·60*	*10·0*	*17·0*			
[4]*A.* "*leucophyrus*"—"Fraser's Hill form"	6	1·6–1·7	2·5–2·9	16–20	16–18	=	0/9	5/9
		1·68	*2·70*	*17·3*	*17·2*			

Means are in italic figures.

[1] Basal extension relative to level of costal spots: = . . . corresponding with costal presector dark spot; + . . . to presector pale spot; ++ . . . to apical half of humeral dark spot +++ . . . to or past base of humeral dark spot (usual condition).

[2] Proportion of specimens seen to possess the character in question (numbers different from those in col. 1).

[3] Andamans—1 (palp measured); Thailand—1; Indo-China—3; Bengal—3; West India (Karwar)—1.

[4] Since it is not yet clear to which species this form belongs, the group name, in inverted commas, is used.

TABLE II.—*Larval characters :* A. leucosphyrus *and* A. balabacensis.

Form	Number of specimens.	Prothoracic hair 1.	Prothoracic hair 13.	Abdominal hair I.9.	Abdominal hair IV.13.
A. leucosphyrus :					
Borneo . .	13	11–17, *14·1*	4–7, *6·2*	4–7, *5·4*	2–5, *3·9*
Malaya . .	22	11–17, *13·2*	4–7, *6·5*	3–7, *4·9*	2–6, *4·2*
Overall . .	35	11–17, *13·5*	4–7, *6·4*	3–7, *5·1*	2–6, *4·1*
A. b. balabacensis :					
N. Malaya .	10	11–22, *15·8*	3–7, *6·2*	3–5, *3·4*	2–4, *2·9*
Thailand . .	6	14–24, *16·9*	4–7, *5·6*	3–5, *3·7*	3–4, *3·1*
Taiwan . .	2	. .	6–7, *6·8*	3–4, *3·3*	3–3, *3·0*
Balabac . .	10	12–22, *15·2*	4–9, *5·6* (8 + in 2/10)	3–5, *3·7*	2–4, *2·9*
Borneo . .	30	10–21, *14·5*	4–7, *5·5*	3–5, *3·5*	2–4, *2·8*
Java . .	15	11–21, *17·7*	5–8, *6·2* (8 in 2/15)	3–5, *4·0*	3–4, *3·1*
A. b. introlatus .	36	10–21, *13·8*	5–11, *7·2* (8 + in 20/36)	3–7, *4·7*	2–5, *3·3*
A. b. baisasi . .	9	14–20, *16·6*	5–7, *5·8*	3–5, *3·6*	3–5, *3·3*
**A.* "*leucosphyrus*"— "Negros form"	3	15–20, *16·8*	4–7, *5·9*	3–5, *3·7*	3–3, *3·0*
**A.* "*leucosphyrus*"— "Fraser's Hill form"	10	15–23, *18·8*	6–10, *8·3* (8 + in 10/10)	3–6, *4·6*	3–4, *3·1*

Means are in italic figures.
* See footnote 4, Table I.

Pupa.

Ratios of lengths of lateral spines IV.A/III.A about 2·4, IV.A/V.A about 0·4. Toothed-margin index averaging 0·90 or more.

Distribution.

MALAYA : SUMATRA ; SARAWAK ; ? INDONESIAN BORNEO.

A. balabacensis balabacensis Baisas, 1936.

Baisas, F. E., 1936, *Philipp. J. Sci.* **59** : 65 (*A. leucosphyrus* var. *balabacensis*).

Type locality : PHILIPPINES : Balabac, Balabac Is.
Types : Male and female in Bureau of Health, Manila.
Synonym : A. leucosphyrus balabacensis (Colless, 1956).

Adult female.

Wing with presector dark mark of vein 1 subdivided by pale spots (usually 1–2), more or less corresponding in length with the presector dark mark of the costa, though in certain forms it may extend basally to about the level of the apical half of the humeral dark mark of the costa. (An accessory sector pale spot often present in the specimens from Borneo, Java and the Philippines, but not in those from the Asiatic Mainland or Taiwan. Maxillary index averaging about 12–14 ; pharyngeal teeth usually rather long and thin, 0·04–0·05 mm. in length, averaging about 14 in number, their apices not deeply

TABLE III.—*Pupal characters :* A. leucosphyrus *and* A. balabacensis.

Form.	Number of specimens.	Abdominal hair III·C.	Abdominal hair IV·C.	Lateral spines, length in mm. III.	Lateral spines, length in mm. IV.	Lateral spines, length in mm. V.	Lateral spines, ratios of lengths IV/III.	Lateral spines, ratios of lengths IV/V.	Toothed-margin index.
A. leucosphyrus :									
Borneo	10	5–13, *7·5*	3–8, *5·1*	0·014	0·032	0·094	1·5–3·3, *2·34*	0·2–0·5, *0·34*	0·80–0·95, *0·89*
Malaya	21	3–8, *5·6*	3–6, *4·6*	0·015	0·043	0·095	1·6–4·0, *2·43*	0·2–0·8, *0·42*	0·87–0·96, *0·92*
A. b. balabacensis :									
N. Malaya	9	7–11, *9·0*	5–10, *6·6*	0·016	0·071	0·090	3·5–5·3, *4·40*	0·7–0·9, *0·79*	0·82–0·89, *0·85*
Balabac[1]	20	7–11, *8·3*	5–8, *6·4*	0·018	0·070	0·093	. *3·80*	. *0·75*	. *0·80*[2]
Borneo	10	7–13, *9·0*	5–9, *6·2*	0·020	0·076	0·099	3·1–6·0, *3·99*	0·7–0·9, *0·78*	0·82–0·91, *0·88*
A. b. introlatus	38	5–13, *8·6*	5–11, *7·5*	0·023	0·087	0·109	2·3–8·0, *3·86*	0·5–1·0, *0·80*	0·84–0·95, *0·90*
A. b. baisasi[1]	15	4–8, *5·4*	3–4, *3·1*	0·011	0·018	0·056	. *1·62*	. *0·32*	0·75–0·79, *0·77*[3]
[4]*A.* "*leucosphyrus*", "Negros form"	3	3–6, *4·5*	3–5, *3·4*	0·014	0·049	0·083	1·3–3·8, *2·83*	0·3–0·6, *0·48*	0·72–0·79, *0·75*
[4]*A.* "*leucosphyrus*", "Fraser's Hill form"	10	5–11, *8·2*	5–10, *6·3*	0·018	0·047	0·118	2·0–3·2, *2·61*	0·3–0·5, *0·40*	0·80–0·89, *0·84*

Means are in italic figures.

[1] From Baisas (1936*a* and *b*) unless otherwise indicated.
[2] From figure in Baisas (1936*a*).
[3] From figure in Baisas (1936*a*), and two specimens measured.
[4] See footnote 4, Table I.

dissected. Hind tarsal segment IV always with some indication of a basal pale band, this usually prominent.)

Larva.

Basal tubercles of the inner and central shoulder hairs usually fused, the inner one with a prominent apical tooth or spine. (Palmate hair of abdominal segment II usually with distinct lanceolate leaflets. Prothoracic hair 13 averaging about 5–6 branches, very rarely with 8 or more. Abdominal hair I.9 usually 3–4 branched; hair IV.13 almost invariably with only 2 or 3 spreading branches and distinctly more than half as long as adjacent hair 12. Pecten teeth not clearly differentiated into long and short types).

Pupa.

Hair III.C averaging about 8–9 branches, hair IV.C about 6. Ratio of lengths of lateral spines IV.A/III.A averaging about 3·8–4·4, of spines IV.A/V.A about 0·7–0·8. Toothed-margin index averaging 0·80–0·88.

Distribution.

India (Karwar, Bengal, Assam); Burma; Thailand; Malaya (near the Thailand border only); Indo-China; ? Hainan; Taiwan; Philippines (Palawan and Balabac Is.); North Borneo; Brunei; Sarawak (extreme north only); Java.

A. balabacensis **introlatus** subsp. n.

Type locality : Malaya : Selangor, 15th mile Ulu Gombak.

Types : Holotype female and allotype male, with three female and two male paratypes, all with corresponding larval and pupal pelts; to be placed in the British Museum (Natural History).

Synonym : A. leucosphyrus " Kepong form " (Colless, 1956).

Differs from the type subspecies as follows :

Adult female.

(*a*) Wing usually with a costal accessory sector pale spot on at least one side (73/80 specimens).

(*b*) Maxillary index averaging about 17.

(*c*) Pharyngeal teeth averaging about 16 in number.

(*d*) Hind tarsal segment IV usually with minute basal pale band or none (a distinct band was seen in only 16/80 specimens).

Larva.

(*a*) Abdominal hair I.9 averaging about 5 branches (this number present on at least one side in 30/36 specimens).

(*b*) Prothoracic hair 13 averaging about 7 branches (8 or more present on at least one side in 20/36 specimens).

Pupa.

Lateral spines III.A and IV.A long, averaging 0·023 mm. and 0·087 mm., the longest in absolute size in the whole *leucosphyrus* group, though only a little longer than in the Borneo form of *A. b. balabacensis*.

Distribution.

Known only from the vicinity of the type locality.

A. balabacensis **baisasi** subsp. n.

Type locality : Philippines : Los Banos, Luzon Is.

Type : Holotype female to be placed in the British Museum (Natural History).

Synonym : A. leucosphyrus, " Luzon form " (Colless, 1956).

Differs from the type species as follows :

Adult female.

(*a*) Wing without any costal accessory sector pale spot ; presector dark spot on vein 1 variable, sometimes extending almost to the base of the vein.

(*b*) Hind tarsal segment IV without any distinct basal pale band. The banding of the fore tarsi is also rather reduced and does not completely encircle the segments, although this is difficult to see in old specimens.

(*c*) Maxillary index 16–18 (2 specimens).

(*d*) Pharyngeal teeth short and stout, length 0·03–0·04 mm. (2 specimens), their apices deeply dissected ; in general appearance resembling those of *A. riparis* rather than *A. balabacensis*. They are also few in number ; two specimens seen had 10 and Baisas (1936*a*) gives 8. (See illustrations in Baisas (1936*a*), and Colless (1956).

Larva.

(*a*) Palmate hair on abdominal segment II very weakly developed, hair-like or with barely flattened branches.

(*b*) Pecten with teeth clearly differentiated into long and short types.

Pupa.

(*a*) Lateral spine IV.A very short, averaging only 0·018 mm. ; ratio of lengths of spines IV.A/III.A about 1·6, of spines IV.A/V.A about 0·3 (these from the mean figures given by Baisas (1936*b*)).

(*b*) Hairs III.C and IV.C weakly branched, averaging about 5 branches and 3 branches respectively.

(*c*) Toothed margin index very low, less than 0·8 (3 specimens).

Distribution.

Known from the type-locality only.

Discussion.

While the systematic position of *A. balabacensis introlatus* seems now to be well established, there remain several important problems for future investigation, in particular the questions of the identity of the " Fraser's Hill form " and of the junction between *introlatus* and the type subspecies. Unfortunately, there remains a large stretch of country, between the state of Selangor and the Thai border, from which I have no specimens at all of *A. balabacensis* ; it is clearly a matter of some importance to trace the transition, if any, between the two forms. This problem resembles that found in Borneo, where the actual boundary between *A. b. balabacensis* and *A. leucosphyrus* has not yet been delimited.

A noticeable feature of both *introlatus* and the " Fraser's Hill form " is the tendency to resemble the sympatric *A. leucosphyrus* in the number of pharyngeal teeth, the maxillary index, the reduced banding of hind tarsal segment IV, the presence of a costal accessory sector pale spot (in *introlatus* only), the short pupal spine IV.A (in the " Fraser's Hill form " only) and the branching of abdominal hair I.9 in the larva. That these resemblances have been introduced by hybridisation seems to be ruled out by present observations and general evolutionary theory, and the explanation must lie either in convergence, due to some direct or indirect adaptive significance attached to these characters, or in relic resemblance to a common ancestral form.

The course of evolution of these forms has been previously discussed (Colless, *op. cit.*), and it seems highly probable that *A. leucosphyrus* arose originally as an endemic species in Sumatra, subsequently re-colonising the Malay Peninsula. It has also been shown (Reid, 1950) that this latter area appears to possess certain peculiarities of environment, probably climatic and possibly involving rainfall distribution, which prevent the southward spread of a number of anopheline species (*A. minimus*, *A. ramsayi*, *A. annularis*, and *A. pallidus*) to which can now be added *A. b. balabacensis*. It seems probable, then, that the resemblances mentioned have been evolved by parallel adaptations to the Peninsula environment before and/or after the colonisation of Sumatra, and the return to Malaya of *A. leucosphyrus*. It is also possible, however, that the "*leucosphyrus*" which colonised Sumatra came from Malaya and still retains traces, adaptive or non-adaptive, of its original parentage.

Unfortunately, we have little precise information as to the finer details of the morphology of the Sumatran *A. leucosphyrus*, but there is one interesting batch of larval specimens (Colless, *op. cit.*: 82) which very likely belong to that form. These show a quite pronounced tendency to resemble *A. balabacensis* in several important features. This calls to mind the fact, discussed by Zeuner (1941) and Reid (1950), that in at least four groups of animals—reptiles, amphibia, butterflies, and mosquitoes—there are species whose distribution stops short at about the Malaya-Thailand border, but which re-appear in Sumatra. It seems, therefore, that the apparent peculiarities of the Malayan environment are absent from Sumatra and that those species which re-appear in Sumatra either traversed the Malay Peninsula before the appearance of such peculiarities, or came by some other route. One sees here some explanation for the above-mentioned resemblance between the Sumatran specimens and *A. b. balabacensis* and also a probability that the resemblances between *introlatus* and the Malayan *leucosphyrus*, and the differences between the latter and the Sumatran form, are actually the result of convergent adaptation to the Malayan environment.

References.

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Reid, J. A., 1950, Some new records of Anopheline mosquitoes from the Malay Peninsula with remarks on geographical distribution. *Bull. Raffles Mus.* **21** : 48.

Zeuner, F. E., 1941, Geology, climate and faunal distribution in the Malay Archipelago. *Proc. R. ent. Soc. Lond.* (A) **16** : 117.

A NEW *CERCYOTHRIPS* (THYSANOPTERA) FROM TRINIDAD.

By J. Douglas Hood.
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The following species must unfortunately be described from a single specimen; but since the original description in 1925 of the genus to which it belongs, also on the basis of a single specimen, no further material has been reported in the literature nor has the genus ever been illustrated. The figure of the present species shows most of the generic characters. The type is in the author's collection.

Cercyothrips galbinus sp. n. (Fig. 1).

Female (macropterous).—Length about 1·1 mm. (distended, 1·2 mm.). Colour yellow, internal pigmentation orange; head, sides of pterothorax, and meso- and metanota shaded with brown and darkest, last 3 abdominal segments deep orange-yellow, terga II–VII and sterna III–VI with grey sub-basal dark line extending nearly to sides; legs about concolorous with body, femora shaded, tibiae with a grey cloud at middle and another at tip, tarsi yellow, save for the darkened cups; fore wings dark grey in anal lobe and in about middle three-fifths, the apical fifth or less colourless, remaining basal portion (of a trifle more than one-fifth of the total length) colourless in its distal one-half and lightly shaded in basal one-half; antennae with segments I and II about concolorous with head, II with abundant internal orange-coloured pigmentation, III–V dark grey in apical third or more and nearly colourless basally, tip of pedicel of III and narrowed basal portion just beyond shaded with grey, pedicels of IV and V likewise darkened, VI–VIII grey.

Head (fig. 1) about 140 μ long (measuring to tip of front) and only 0·8 times the width across eyes (172 μ), much narrowed toward base, where the width (126 μ) is about three-fourths that across eyes; front unusually broad, its overall width (34 μ) in excess of that of first antennal segment; dorsal surface finely and closely (but not conspicuously) transversely striate in the area posterior to ocelli, and longitudinally striate at sides in front of median ocellus; chaetotaxy as shown in figure; no occipital groove. *Eyes* very widely separated, strongly protruding anteriorly but not at sides, their dorsal length (87 μ) more than 0·6 times that of head, their interval about equal to the distance between outer margins of first antennal segment. *Ocelli* slightly elevated, the median one directed forward and somewhat overhanging the downwardly-sloping area in front. *Mouth-cone* normal to the genus; maxillary palpi 2-segmented. *Antennae* 8-segmented, formed very much as in *Sericothrips*, with U-shaped trichomes on segments III and IV (see fig. 1 for that on III) and with the long single trichome at middle of inner surface of VI extending well beyond tip of VII; II with conspicuous trans-striation, inner dorsal seta at tip longer than outer; lengths (and widths) of antennal segments as follows (in μ): I 20 (32), II 40 (29), III 63 (20), IV 58 (20), V 45 (16), VI 54 (14), VII 11 (7), VIII 7 (5).

Prothorax with pronotum about 104 μ long medially, width (exclusive of coxae) about 172 μ, dorsal surface very finely, but not at all conspicuously, cross-striate (see fig. 1), the striae scarcely visible under a magnification of 100 diameters, the distance between them about 3 μ; chaetotaxy shown in figure. *Mesothorax* about 176 μ across anterior angles, its greatest width 210 μ; mesonotum much more conspicuously cross-striate than prothorax, the striae much stronger, closer, and darker; metanotal pelta cross-striate in a similar manner in front of the pair of submedian setae, much more finely and closely diagonally striate in the postero-lateral concavities, and delicately reticulo-striate in

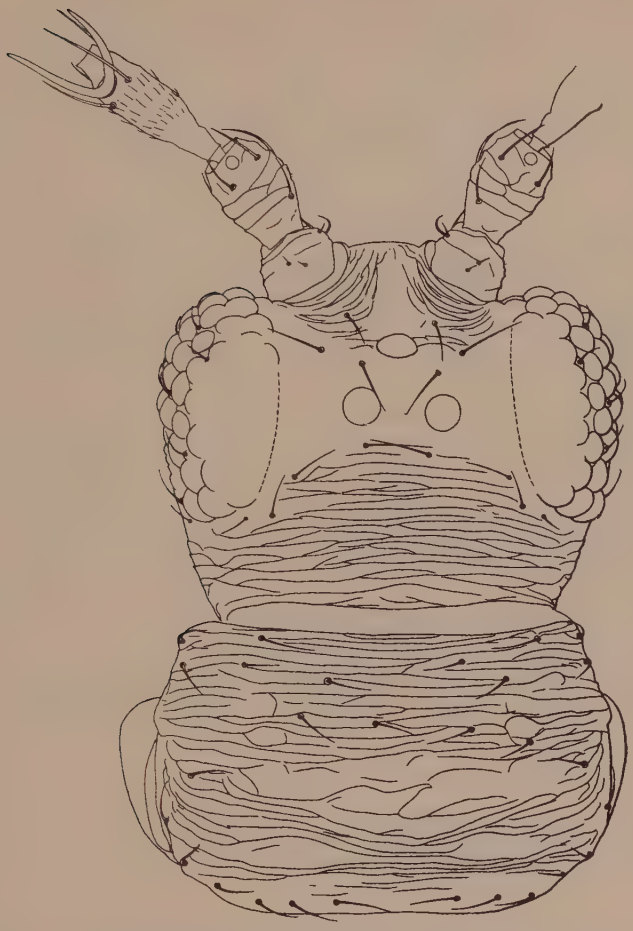

FIG. 1.—*Cercyothrips galbinus* sp. n. Head, prothorax, and portions of antennae ; ♀, holotype (camera lucida).

median portion between the latter. *Legs* typical of the subfamily ; femora and tibiae with the usual numerous setae, these dark in colour. *Fore wings* as in allied genera 605 μ long, with the two usual longitudinal veins ; costa with about 26 dark setae, fore vein with 3 + 4 + 1 + 1, hind vein with 3 or 4 in apical one-half.

Abdomen broadest (253 μ) at segment V, IX longest (93 μ) and more heavily sclerotised, ovipositor 210 μ ; dorsal surface of abdomen smooth in median third or more, lateral portions with raised lines of sculpture whose outer ends curve strongly backwards, these striae on III–VIII with numerous microtrichia ; VIII with comb along posterior margin ; setae dark grey, IX with setae I, II, and III respectively 50, 85, and 67 μ, X with I 67, II 57.

Holotype ♀, TRINIDAD : El Tucuche, 22.vi.1951, in flight on the summit of the mountain (*J. D. Hood*).

As was mentioned above, this is the second known species of the genus and is also based upon a single female. Morgan's type came from Puerto Rico, but

I believe that I have it in series from elsewhere. This series of more than 25 specimens of both sexes agrees well with Morgan's description (Morgan, 1925): (1) the fore wings are nearly clear in their basal two-fifths (except for a slight degree of shading in the base of the anal lobe), (2) the dorsal surface of the head and prothorax are, as Morgan says, " very distinctly though finely transversely striate ", and (3) the colour by transmitted light is largely " deep brown ". However, though Morgan says that the dorsal surface of the head is " transversely striate, and very slightly so in front of median ocellus ", it would appear that he merely failed to express what he had in mind, because in both of the species which the writer has seen, the striation on the front of the head, though essentially similar to that on most of the rest of the dorsal surface, is longitudinal, rather than transverse. It is highly unlikely that the sculpture in this area would take a different direction in a congeneric species.

C. galbinus can best be contrasted with *C. striatus* Morgan by reference to the three characters numbered in the above paragraph. (1) In *C. galbinus* the fore wings are wholly dark in the anal lobe, and paler in the remainder of their basal 0·2 or 0·3, but with only the outer one-half of this area colourless; (2) the striation of the head and pronotum is pale and not at all distinct, but must be searched for under relatively high magnification (430 ×); and (3) the general colour of the body is nearly yellow, rather than deep brown.

In describing the genus *Cercyothrips* Morgan mentioned a certain resemblance between it and *Limothrips*, and a similarity between it and *Sericothrips*. The former genus is not at all closely related to *Cercyothrips*, which takes a natural place in the Sericothripinae, in the neighbourhood of *Echinothrips* and *Sericothrips*.

Reference.

Morgan, A. C., 1925, A new genus, a new subgenus and seven new species of Thysanoptera from Porto Rico. *Florida Ent.* **9**: 1–9.

A STUDY ON THE FORMS OF *HAPLOTHRIPS* (*TRYBOMIELLA*) *APICALIS* PRIESNER.

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Haplothrips apicalis Priesner belongs to the subgenus *Trybomiella* in view of the absence of double fringes in the fore wings. Though originally included by Bagnall in the genus *Hindsiana*, it was subsequently transferred to *Haplothrips* by Priesner (1933). Ananthakrishnan (1956), in a preliminary survey, has recorded the existence, in large populations of *H. apicalis*, of apterous and brachypterous forms in almost equal proportions and of very much fewer macropterous individuals. Samples of various sizes, during different times of the year, have confirmed this and shown that in *apicalis* apterism and brachypterism are predominant irrespective of the different conditions of temperature and humidity.

Distribution and Hosts.

In its distribution, *H. apicalis* is typically Indo-Malaysian and no records exist of its occurrence elsewhere. Though Bagnall records purely apterous forms from a jungle plant in Almora (N. India), various kinds of grasses constitute their favourite habitat. Ramakrishna and Margabandhu (1940) recorded them from *Panicum* and *Stemmodia* in Guntur (S. India). The author, in the course of his studies on the Thysanopteran fauna of grasses, has recorded these forms from *Andropogon pertusus*, *Panicum maximum* (Guinea grass), *Cynodon dactylon*, *Eleusine coracana*, etc. While *apicalis* cannot be collected with certainty from the majority of the above grasses, it can easily be collected in numbers throughout the year from the sheaths of *C. dactylon*, which is its true host. The author himself collected these forms in bulk from April, 1954 to December, 1956 and on no occasion were they scarce on this grass.

Haplothrips (*Trybomiella*) *apicalis* Priesner.

Hindsiana apicalis Bagnall, 1915, *Ann. Mag. nat. Hist.* (8) **15** : 323.
Hindsiana apicalis Ramakrishna, 1928, *Mem. Dep. Agric. India* (*Ent.*) **10** : 290.
Haplothrips apicalis Priesner, 1933, *Rec. Indian Mus.* **35** : 361.
Hindsiana apicalis Ramakrishna and Margabandhu, 1940, *Cat. Indian Insects* **25** : 35.
Haplothrips apicalis Ananthakrishnan, 1956, *Curr. Science* **25** : 225–6.

The apterous, brachypterous and macropterous forms are not differently coloured. Priesner (1933) described the coloration of the macropterous female and an examination of several individuals shows the same grades, ranging from extremely pale yellowish-brown to very dark, golden yellowish-brown forms.

Female (*macropterous*).—For measurements see Table III. *Head* 1·2–1·3 times as long as wide across eyes, cheeks slightly rounded, slightly constricted at base and with a few

weak setae ; eyes large, 50–73 μ long, occupying about one third of head length, not protruding and closely and finely facetted ; ocelli borne on a distinct hump ; postocular setae slightly dilated at apex, 32–44 μ long ; ante- and interocellar setae weak, 8–13 μ long ; well developed ventral setae of which a pair close to inner margin of eyes (43–51 μ long) and another on medial side of base of labrum (45–48 μ long) are prominent, fine and pointed ; mouth-cone short, broadly rounded, maxillary palpi and labial palpi 26–32 μ and 16–19 μ long respectively ; antennae as in figure, 1·57–1·73 times head length ; measurements as in Table III. *Pronotum* 154–182 μ long, at middle about 0·8–0·9 times head length ; its length 0·5–0·6 times width of prothorax including coxae ; prothoracic bristles well developed, little dilated at apex ; anteroangulars 26–32 μ ; anteromarginals 22–26 μ, midlaterals 24–26 μ, epimerals 39–48 μ, postangulars 39–45 μ. *Pterothorax* about as long as wide, without any conspicuous bristles at sides ; wings ranging in length from 0·560 to 0·700 mm. (only a single specimen had a short, but well developed fore wing with fringes, measuring 0·390 mm.) ; double fringes absent ; sub-basal bristles almost in a line, slightly knobbed, measuring respectively 24, 25 and 32 μ long ; fore femora moderately enlarged (58 μ wide), fore tarsal tooth small to minute, always present, placed slightly away from base of tarsus ; on inside of base of fore, mid and hind femora, a long, finely pointed seta measuring 58, 51 and 54 μ long respectively ; abdominal segments 1–4 uniformly wide, about 308 μ, 128 μ and 93–96 μ long respectively ; tube 112–119 μ long ; lateral setae 154–160 μ long.

Male (*macropterous*).—For measurements see Table III. (*Note :* in a single gynaecoid (apterous) male, the length was only 1·372 mm.) General colour as in female. *Head* 1·2 times as long as wide across eyes ; eyes 56–63 μ, postoculars 32–38 μ, anterocellars and interocellars 6–8 μ in length, ventral setae like those of female, but shorter, the pair near the eyes 35 μ and that near base of labrum 32 μ long ; mouth-cone short, broad at apex,

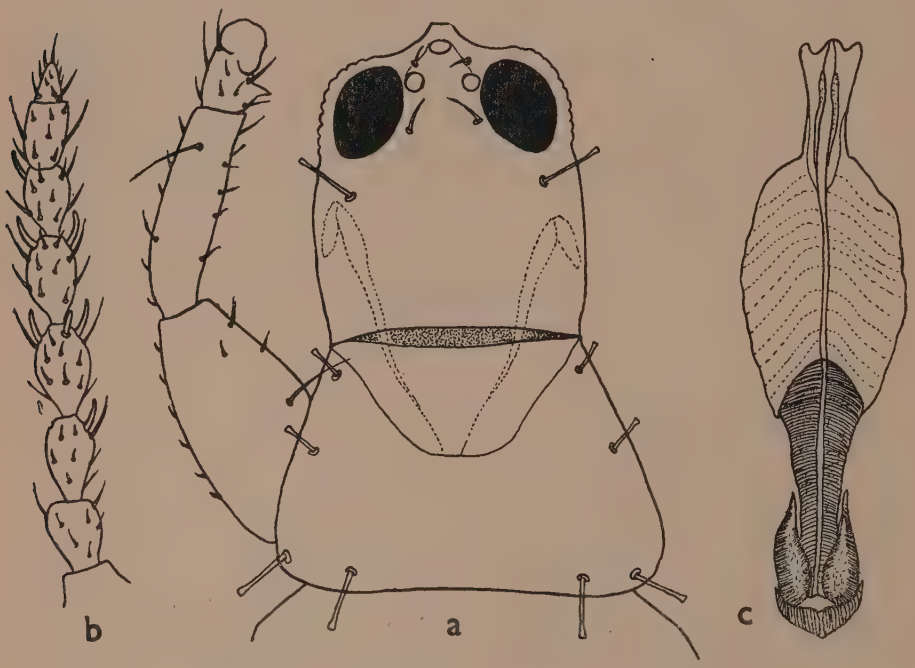

FIG. 1.—*Haplothrips apicalis* Priesner. (a) Head and prothorax of male ; (*b*) antenna of female ; (*c*) genitalia of male.

maxillary and labial palpi 32 and 16 μ long respectively ; antennae 308–336 μ long ; antennal segments as in Table III. *Prothorax* 140–154 μ long, 0·8 times head length, and 238–266 μ wide inclusive of coxae ; prothoracic bristles : anteroangulars 25–29 μ, midlaterals 22–26 μ, epimerals 32–38 μ, postangulars 32–35 μ, wings ranging in length from 0·458 to 0·630 mm. ; without double fringes ; sub-basal wing bristles 22, 26 and 21 μ long respectively ; fore femora enlarged, in normal males 60–70 μ wide, 48 μ in gynaecoid male and 80 μ wide in oedymerous males ; fore tarsus with stronger tooth than in female, 10–16 μ long and 10–13 μ wide at base ; (in the oedymerous male it is 19 μ long and 16 μ wide ; and 6 μ long and 6 μ wide in the gynaecoid male) ; basal abdominal segments 238 μ wide ; bristles 1 and 2 on IX 112–118 and 109–112 μ and pointed seta between them 35–38 μ long ; tube 98–112 μ long, 56 μ wide at base and 28 μ at apex ; median dorsal anal bristles 29–32 μ long, pointed ; lateral anal setae 128–134 μ long.

Genitalia.—General appearance as in figure ; pseudovirga 38–45 μ long, 16–18 μ wide at apex, slightly neck-like constriction present just before apex, which bears a median and two lateral lobes ; pseudovirga 13 μ wide at middle and 16 μ at base ; bladder smooth with parallel lines, not rugged in sculpture, 48 μ wide at middle (in lateral view) and 54 μ in normal position ; ductus ejaculatorius conspicuous at distal end, chitinised, the widened portion measuring 58 μ from near base of pseudovirga to apex. Parameres 43–48 μ long and 10–13 μ wide at base.

Proportions of Occurrence of Apterous, Brachypterous and Macropterous Individuals in Different Samples.

The meagre representation of macropterous individuals in all samples examined has been mentioned ; their maximum proportion was 12 per cent. and in most samples between 6 and 8 per cent. It is difficult to establish

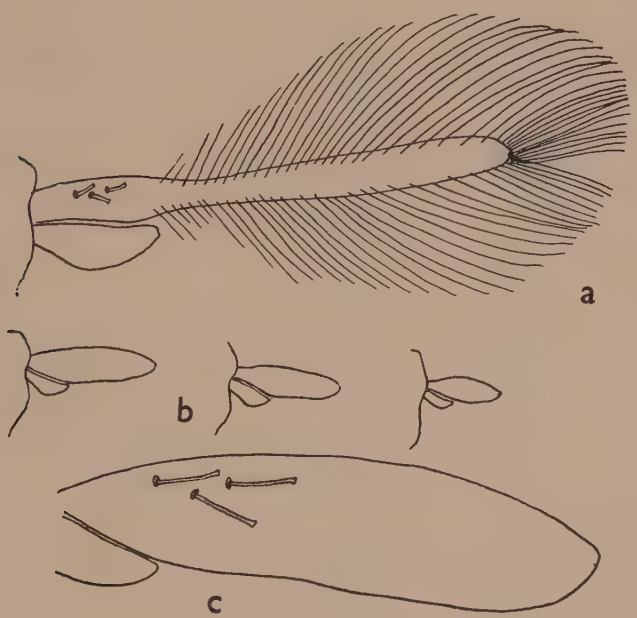

Fig. 2.—*Haplothrips apicalis* Priesner. Wings of macropterous and brachypterous forms: (*a*) Macropterous wing (under low power) ; (*b*) different grades of brachypterous wings (under low power) ; (*c*) brachypterous wing (under high power).

the relative predominance of apterous or brachypterous forms, since they show considerable fluctuation; the brachypterous individuals, for instance, in one sample reached 67 per cent. while in another they were only 46 per cent.

TABLE I.—*Proportions of apterous, brachypterous and macropterous forms in different samples.*

Sample No.	Total number in sample.	% apterous forms.	% brachypterous forms.	% macropterous forms.
1	204	48	46	6
2	164	33	60	7
3	158	29	65	6
4	102	47	45	8
5	73	51	38	11
6	67	54	34	12

POPULATION GROUPS BASED ON WING LENGTH FREQUENCIES.

The brachypterous forms fall into 12 groups with wing lengths ranging from 126 to 280 μ, while the macropterous forms fall into five groups with wing lengths ranging from 560 to 700 μ (females). Only a single female had a fully developed wing measuring 390 μ in length.

TABLE II.—*Fore wing length frequencies of a sample of* 204 *individuals.*

Number of groups.	Wing groups (fore wing length).	Hind wing length.	Number of males.	Number of females.	Total number.
Apterous					
1			23	75	98
Brachypterous—					
2	0·126	0·098	1	2	3
3	0·140	0·112	4	2	6
4	0·154	0·126	5	3	8
5	0·168	0·140	10	3	13
6	0·182	0·154	6	8	14
7	0·196	0·168	2	4	6
8	0·210	0·182	3	12	15
9	0·224	0·196	2	8	10
10	0·238	0·210	3	7	10
11	0·252	0·224	0	3	3
12	0·266	0·238	1	1	2
13	0·280	0·252	1	3	4
Macropterous—					
14	0·560	0·532	2	0	2
15	0·616	0·574	1	0	1
16	0·644	0·616	0	1	1
17	0·672	0·616	0	1	1
18	0·686	0·630	0	1	1
19	0·700	0·658	2	4	6

TABLE III.—*Analysis of structural variation in apterous, brachypterous and macropterous individuals.*

	Apterous.		Brachypterous.		Macropterous.	
	Females.	Males.	Females.	Males.	Females.	Males.
Body length (mm.)	1·72–1·95	1·26–1·57	1·79–1·96	1·47–1·57	1·76–2·16	1·57–1·74
Head: length (μ)	189–196	168–182	182–196	168–182	196–203	168–182
Head: width (μ)	154–168	140–154	154–168	140–154	154–168	140–154
Antennal segments, length (width) in μ—						
i	26–35 (26–29)	29–35 (29–32)	32–35 (29)	29–32 (26–29)	26–29 (29–32)	29–32 (26–29)
ii	38–45 (26–29)	38–45 (22–28)	38–46 (29)	38–45 (24–26)	45–48 (26–29)	43–48 (22–28)
iii	45–51 (22–26)	48–51 (20–22)	45–51 (26)	45–48 (22–26)	48–51 (22–29)	48–55 (22–28)
iv	48–53 (26–29)	51–54 (26)	51–54 (29)	51–54 (26–29)	51–54 (29–32)	48–54 (26–29)
v	43–45 (22–24)	45–47 (22–26)	48–51 (26)	48 (23–26)	48–51 (21–26)	48–51 (22–26)
vi	38–45 (19–25)	38–43 (19–22)	43–46 (22)	38–44 (20–22)	43–45 (22–26)	43–45 (19–22)
vii	38–45 (16–18)	38–43 (16–19)	43–45 (19–22)	43 (19–22)	43–45 (19–22)	38–43 (16–19)
viii	29–32 (10–13)	24–29 (10–13)	26–29 (10–13)	27–29 (10–13)	29–32 (10–13)	26–29 (10–13)
Prothorax—						
Length (μ)	154–168	140–154	154–168	140–154	154–182	140–154
Width including coxae (μ)	266–294	238–266	266–294	238–266	280–308	238–266
Pterothorax: length (μ)	266–294	210–280	280–294	210–280	308–350	210–280
Wing: length (μ)			126–280	126–224	560–700	458–630
Tube: length (μ)	112–119	98–112	112–119	98–112	112–119	98–112

TABLE IV.—*Comparison of gynaecoid, normal and maximum oedymerous males.*

(All measurements given in μ, except the first entry).

Measurements of:	Gynaecoid.	Normal.	Maximum oedymerous.
Total body length	1·372 (mm.)	1·428 (mm.)	1·554 (mm.)
	μ	μ	μ
Head: length	168	182	182
Head: width across eyes	140	154	154
Postoculars	32	32	38
Interocellars	6	8	13
Antennal segments, length (width)—			
i	26 (26)	29 (26)	38 (32)
ii	32 (26)	43 (22)	45 (26)
iii	45 (22)	48 (22)	48 (24)
iv	48 (26)	48 (29)	54 (23)
v	48 (22)	48 (22)	53 (26)
vi	42 (19)	43 (19)	45 (22)
vii	38 (18)	38 (16)	45 (19)
viii	24 (10)	26 (10)	32 (13)
Prothorax—			
Length	126	168	168
Width at base	210	238	252
Epimerals	34	32	38
Postangulars	35	35	38
Fore femoral width	48	64	80
Pterothorax: length	224	266	266
Mesothorax: width	224	238	252
Tarsal tooth: length (width at base)	6 (6)	16 (13)	19 (16)

TABLE V.—*Relation between femoral width and antennal length in males.*

Width of fore femur (μ).	Antennal length (μ).
48	280
58	308
64	322
70	326
73	350
80	357

TABLE VI.—*Distribution of body lengths in a sample containing* 197 *individuals.*

Females.				Males.			
Number of groups.	Group range.	Number of individuals.	Average length.	Number of groups.	Group range.	Number of individuals.	Average length.
1	1·5–1·6	2	1·526	1	1·2–1·3	4	1·238
2	1·6–1·7	5	1·630	2	1·2–1·3	4	1·350
3	1·7–1·8	9	1·760	3	1·4–1·5	4	1·456
4	1·8–1·9	43	1·833	4	1·5–1·6	18	1·557
5	1·9–2·0	36	1·943	5	1·6–1·7	19	1·557
6	2·0–2·1	33	2·040	6	1·7–1·8	8	1·727
7	2·1–2·2	5	2·159	7	1·8–1·9	4	1·835
8	2·2–2·3	1	2·338	8	1·9–2·0	2	1·918

IMMATURE STAGES

First instar larva.—Length from 0·448 to 0·560 mm. General colour pale grey-yellow; eyes black; antennae uniformly greyish-yellow. Abdominal segments 8–10 with dark red pigment. Head 56 μ long, 56 μ wide across eyes; prothorax 56 μ, pterothorax 98 μ, terminal filament 70 μ long; antennal segments length (width): 16 (22); 19 (16); 22 (22); 20 (22); 19 (16); 22 (6).

Second instar larva.—General colour, dark yellowish-grey; antennal segments 1–3 yellowish, 4–7 dark grey; eyes black.

In a sample of 104 adult individuals were some larvae of which 21 belonged to the second instar, ranging from 0·910 mm. to 1·540 mm. in length. Of these, 12 were between 1·148 and 1·232 mm., while the rest showed varied lengths. The gradation in length of the second instar may be classified as follows: 0·910; 1·022; 1·148; 1·232; 1·126; 1·470 and 1·540 mm.

Measurements of an average sized second instar larva.—Total body length 1·232 mm. Head 112 μ long, 98 μ wide; eyes 42 μ long; postocular setae 26 μ long; prothorax 126 μ long and 252 μ wide at base; antennal length 182 μ; segments, length (width): 14 (28); 21 (14); 42 (21); 42 (21); 28 (14); 21 (14); 14 (7). Terminal filament 154 μ long.

Prepupa.[1]—Total body length 1·232 mm. Head 126 μ long and 140 μ at middle; prothorax 140 μ long and 280 μ wide at base; pterothorax 280 μ long; tube 112 μ.

Pupa I[1] (of macropterous form).—Body length 1·330 mm.; head 154 μ long and across cheeks 140 μ wide; prothorax 280 μ long; wing pads 364 μ long.

Pupa II[1] (of macropterous form).—Total body length, 1·456 mm.; head 175 μ long and across eyes 140 μ wide; eyes 42 μ long; prothorax 140 μ long at base inclusive of coxae, 322 μ wide; wing pads: fore wing 406 μ, hind wing 364 μ; tube 98 μ long.

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[1] Only one or two specimens of each.

NEW SPECIES OF THE GENUS *DIPLATYS* SERVILLE (DERMAPTERA : PYGIDICRANIDAE).

By W. D. Hincks.
(*Manchester Museum*).

The five new species of *Diplatys* Serville described in this paper have been received since the writer's revision (1955) was submitted for publication. An additional species, *D. excidens*, from South India, was described in 1954 (Hincks, 1954), after the revision was in the press. Eighty-one species of *Diplatys* have been described, including those brought forward in the present paper, a considerable increase since Burr's papers of 1904 and 1911 in which he included 15 and 30 species respectively.

Thanks are due to Dr. D. R. Ragge for the opportunity to describe material in the British Museum (Nat. Hist.), to Dr. W. J. Hall for specimens received through the Commonwealth Institute of Entomology, and to Dr. R. Paulian for specimens belonging to the Scientific Institute of Madagascar.

Diplatys mucronatus sp. n. (Fig. 1).

Male (microlabic): *Colour* fuscous; antennae proximad, mouthparts, pronotum, legs except knees, shoulders, disc of wing-scales, and intermediate abdominal tergites, fulvous. Integument with micro-sculpture; pubescence rather long, scattered, sparse. *Head* about as long as broad; frons passing rather abruptly into depressed and rugose occiput; frontal sutures obsolete; coronal suture strong and deep; postocular carinae strong, more or less straight, evanescent caudad. Eyes prominent, longer than genae, but not markedly so. Antennae broken. *Pronotum* elongate, widest near cephalic angles; sides almost straight, converging caudad; caudal margin more or less truncate. *Tegmina* and *wings* fully developed. *Abdomen* cylindrical, slender, slightly expanded from eighth tergite. Ultimate tergite rather narrow; caudal margin slightly concave mesad, oblique laterad; concavity bounded by a prominence on each side corresponding with an elevated process at base of forceps; distal portion of disc with an elongate raised area mesad, before caudal margin. *Forceps* long and slender, straight, tapering, subcontiguous; inner margin crenulate. *Penultimate sternite* elongate; sides slightly contracted caudad; caudal margin more or less truncate. *Genitalia* (fig. 1): parameres with an accessory mucro at distal extremity; virga relatively short. *Length* 10 mm.

Female: Unknown.

Type.—Madagascar: Morondava, forest south of Bofasy, 1 ♂, i.1956 (*R. Paulian*). (Inst. Sc. Madag.).

This species is related to *D. longicornis* Hincks, 1955, and *D. insularis* Borelli, 1932. From the former it is distinguished by the shorter virga, mucronate parameres, and entire penultimate sternite; from the latter by the smaller eyes and mucronate parameres. From *D. viator* Burr, 1904 (*hova* Burr, 1914) it is distinguished by the form of the penultimate sternite.

Diplatys gracillimus sp. n. (Fig. 2).

Male (microlabic): *Colour* piceous; mouthparts, proximal antennal segment (all remaining), sides of pronotum, scutellum and shoulders, sides of tegmina and a large common discal spot, and forceps, fulvous; legs (posterior only remaining) stramineous, tibiae almost whitish, femora pale fulvous in distal two-thirds. Integument with fine micro-sculpture; pubescence fine, short, even, decumbent. *Head* longer than broad; frons and occiput hardly differentiated, former gradually passing into latter; frontal sutures obsolete; coronal suture distinct; postocular carinae absent. Eyes large, moderately prominent, clearly longer than genae. Antennae broken, only proximal segment remaining. *Pronotum* slightly longer than broad; broadest towards cephalic angles; sides slightly rounded, contracted caudad; caudal angles and caudal margin conjointly rounded. *Tegmina* and *wings* fully developed. *Abdomen* very slender, cylindrical, moderately expanded before ultimate tergite; latter with caudal margin concave mesad, oblique laterad, concavity terminating on each side in a slight prominence coinciding with a strongly elevated process at base of forceps; caudal part of disc impressed mesad, depression containing an elongate tumidity. *Forceps* subcontiguous, simple, slender, tapering; inner margins strongly crenulate. *Penultimate sternite* elongate; caudal margin truncate except for a very small median sinuation. *Genitalia* (fig. 2). *Length* 7 mm.

Female: Unknown.

Type—MADAGASCAR: Maroantsetra, Ambodivoangy, 1 ♂ (*J. Vadon*). (Inst. Sc.Madag.).

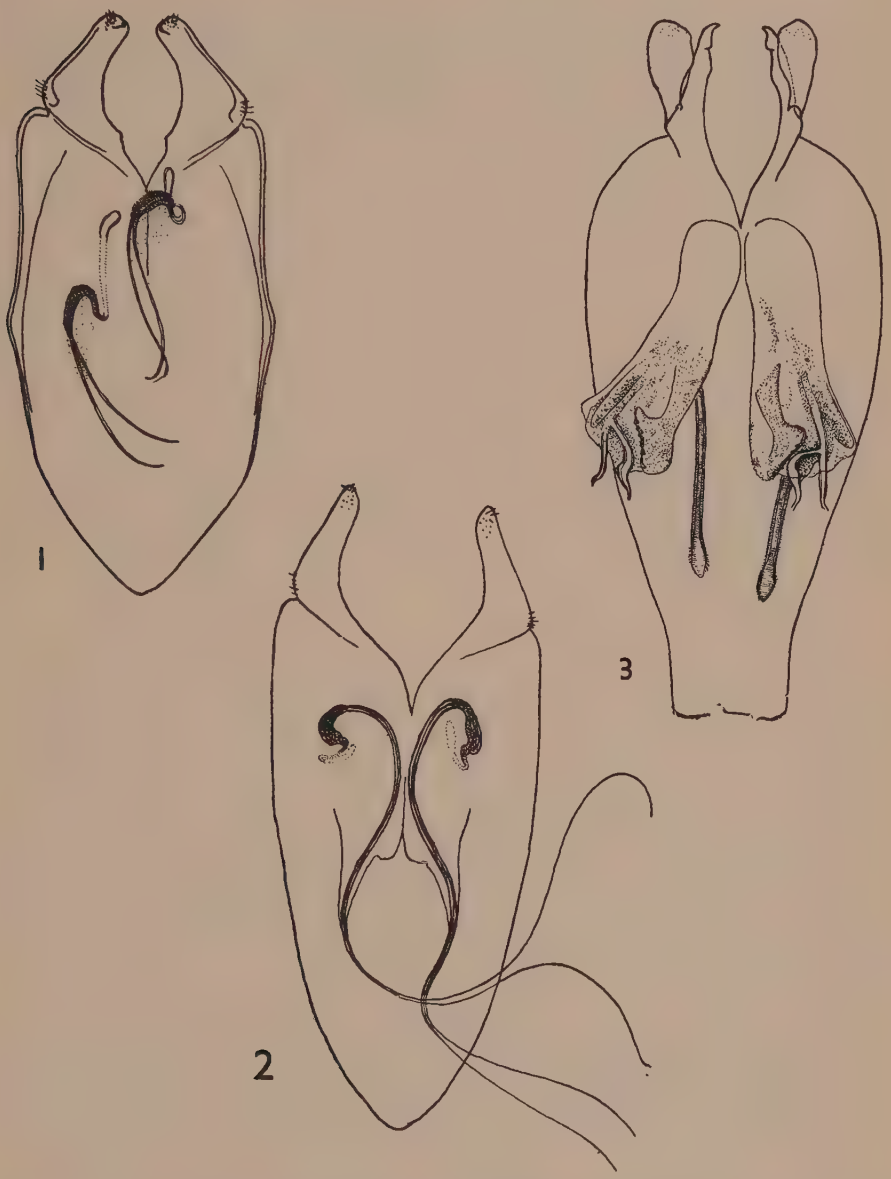
This very slender and graceful species is evidently closely allied to *D. olsufiewi* Borelli, 1932, a species known to me only from the original description. The present species differs in having the eyes longer than the genae, in the evidently longer occiput, in having the penultimate sternite sinuate mesad, and in the coloration. Of the Madagascan species known to me *D. gracillimus* is most nearly related to *D. nanus* Burr, 1914, but differs in coloration, in its slenderer form, and in the absence of a large denticulate plate in the distal lobe of the genitalia. Unfortunately the antennae, and anterior and intermediate limbs of the unique type have been lost. It is noted that one posterior tarsus consists of only two, instead of three, tarsal segments, a type of deformity which occurs not infrequently in the Dermaptera.

Diplatys malayanus sp. n. (Fig. 3).

Diplatys greeni Borelli (*nec* Burr), 1932, *Bull. Raffles Mus.* **7**: 80 (without description; Malay Peninsula, foothills NW. Mt. Ophir, 1200–1300 feet).
Diplatys sp. ? Hincks, 1955, *Syst. Mon. Dermapt.* **1**: 87, fig. 107 (genitalia).

Male (macrolabic).—*Colour:* head, pronotum and tegmina dull black; abdomen castaneous; most of antennae and outer half of wing-scales, fuscous; distal one-third of second and third segments of maxillary palpi, distal extremity of first and entire second segment of antennae, a spot on anteclypeus, neck and scutellum, distal and proximal portions of femora and tibiae, tarsi in part, and inner half of wing-scales, testaceous. *Head* as broad as long, broadest across eyes which are large, prominent and longer than genae; frons moderately tumid; occiput moderately depressed, slightly uneven; passage from former to latter rather abrupt; frontal sutures obsolete; coronal suture short, distinct; postocular carinae distinct, slightly curved, evanescent near caudal margin. *Pronotum* as broad as long, sides strongly contracted caudad (similar to *D. mixtus* Borelli, *see* Hincks 1955, fig. 100). *Tegmina* and *wings* fully developed. *Abdomen* cylindrical to seventh

tergite, thence expanded to strongly inflated ultimate tergite. Latter transverse (outline similar to that of *D. sublobatus* Borelli, *see* Hincks, 1955, fig. 84); caudo-lateral angles prominent; caudal margin concave mesad; surface finely asperate. *Forceps* contiguous proximad, thence strongly curved, especially distad, enclosing a transverse space. *Penultimate sternite* with caudal margin slightly concave mesad; sides oblique; disc feebly



FIGS. 1–3.—(1–3) Male genital armature of (1) *Diplatys mucronatus* sp. n. (2) *D. gracillimus* sp. n. (3) *D. malayanus* sp. n.

longitudinally impressed mesad, with a low rounded tumidity on each side (similar to *D. mixtus* Borelli, *see* Hincks, 1955, fig. 101). *Genitalia* (fig. 3). *Length* 15 mm.

Female : Unknown.

Type.—Malaya : Kuala Lumpur, 1 ♂, 28.ix.1928, at light (*G. H. Corbett*). (British Museum (Nat. Hist.)).

This species is clearly identical with the male wrongly identified by Borelli as *D. greeni* Burr, from Malaya, and included in the writer's revision (1955 : 81, 87) as *Diplatys* sp. ?, on the basis of a mount of the genitalia in the Turin Museum prepared by Borelli. This mount is on a slide with the genitalia of several other species of *Diplatys*, covered by a fragment of coverslip, and embedded in thick, now discoloured, balsam. The male from which the mount was prepared is probably in the Raffles Museum. Owing to the discoloured, thick balsam obscuring the mount the lobiform external division of the paramere was not fully disclosed and the 1955 figure is therefore inaccurate. The distinction between the *nigriceps* and *gladiator* groups is not very satisfactory so that it will be best to combine the three species of the latter with the former group. *D. malayanus* is therefore assigned to the *nigriceps*-group and is most closely related to *D. salvazae* Burr, 1917, from Indo-China. It is easily distinguished from other members of the group by the characteristic genitalia, especially the form of the parameres and the presence of a large toothed plate in the distal lobe. Other well-marked characters include the strong postocular carinae, contracted pronotum and medially concave caudal margin of the penultimate sternite. It is impossible to say whether this is the same species as the damaged female type of *D. ridleyi* Kirby, 1903, from Singapore (*see* Hincks, 1955 : 95).

Diplatys denticulatus sp. n. (Figs. 4, 5).

Male (microlabic) : *Colour* fuscous ; anteclypeus, metazona, scutellum and legs in part, testaceous. Fore parts micro-reticulate. *Head* with eyes very large and prominent, clearly longer than genae ; frons tumid, passing rather gradually into strongly depressed and rugose occiput ; frontal sutures obsolete ; coronal suture well developed ; postocular carinae strong, almost complete, curved. Antennae broken. *Pronotum* longer than broad, broadest near cephalic angles, thence gradually contracted caudad ; caudal margin truncate. *Tegmina* and *wings* fully developed. *Abdomen* cylindrical throughout, hardly expanded distad ; ultimate tergite normal for the microlabic phase in this genus. *Forceps* subcontiguous, simple, tapering, straight except at extreme apex ; inner margins crenulate. *Penultimate sternite* (fig. 4) elongate ; caudal margin with a round median sinuation bounded on each side by an evident tooth ; margin laterad of sinuation with minute denticulations. *Genitalia* (fig. 5). *Length* 11 mm.

Female : Unknown.

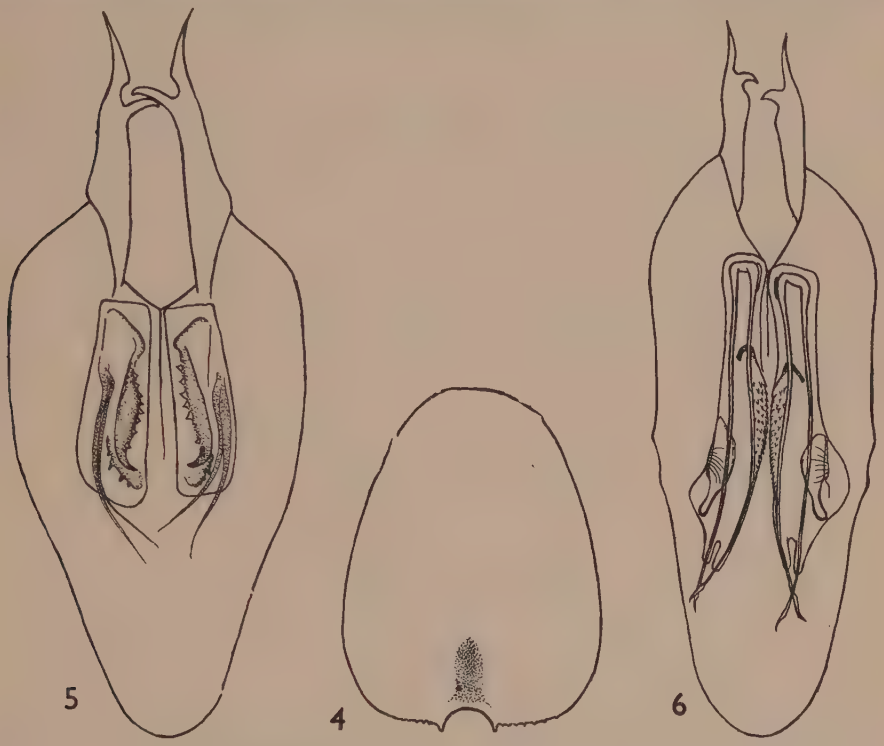
Type.—Burma : Taungyi, 1 ♂, v.1934 (*Prof. F. J. Meggitt*). (British Museum (Nat. Hist.) ; Commonwealth Institute of Entomology.)

An easily distinguished member of the *greeni* group at once separable from all the other members by the denticulate caudal margin of the penultimate sternite. The genitalia also are very characteristic, having a long simple virga and a pair of toothed accessory plates in the distal lobe, the upper one terminating in a very strong tooth. This species is related to *D. annandalei* Burr, 1911, from Siam, from which it differs in the form of the penultimate sternite, in the

shorter simple virga, and in the presence of the large toothed plates already mentioned.

Diplatys dolens sp. n. (Fig. 6).

Male (mesolabic): *Colour* piceous; anteclypeus, second and third antennal segments, and metazona, testaceous; palpi, rest of antennae and legs largely fulvous; last with femora and tibiae proximad and distad, and metatarsus, subtestaceous. *Head* slightly broader than long; surface micro-reticulate; frons tumid, passing rather abruptly into depressed and slightly rugose occiput; frontal sutures obsolete; coronal suture strong and deep; postocular carinae strong, straight, complete. Eyes large and prominent, longer than genae. Antennae broken. *Pronotum* micro-reticulate; clearly longer than broad;



FIGS. 4–6.—(4) Male penultimate sternite of *D. denticulatus* sp. n. (5–6) Male genital armature of (5) *D. denticulatus* sp. n. (6) *D. dolens* sp. n.

sides more or less parallel mesad, contracted behind and conjointly rounded with caudal margin. *Tegmina* and *wings* fully developed, micro-reticulate. *Abdomen* micro-reticulate, pubescent, cylindrical, slightly expanded from eighth tergite; ultimate tergite subquadrate, a little broader distad than proximad; caudal margin slightly concave mesad, oblique laterad; disc with median sulcus well developed. *Forceps* slightly separated, more or less flattened, straight, tapering, with a strong inner tooth near base. *Legs* normal for the genus. *Penultimate sternite* with caudal margin truncate. *Genitalia* (fig. 6). *Length* 12 mm.

Female: Unknown.

Type.—INDIA, without further data, 1 ♂ (*T. R. Bell*). (British Museum (Nat. Hist.)).

This species shows a close external resemblance to several Indian species of the *greeni* group. The straight postocular carinae and truncate caudal margin of the penultimate sternite distinguish it from *D. confusus* Hincks, 1955. Similar characters and the more abrupt junction of frons and occiput, together with the longer occiput, separate it from *D. nilgiriensis* Hincks, 1955. The toothed forceps and truncate penultimate sternite of the present species resemble those of *D. coelebs* Hincks (1955, figs. 140, 142) but again the straight postocular carinae distinguish it from that species. From all three species, however, the male genital armature of *D. dolens* will at once distinguish it. The long slender virga would place it near *D. fletcheri* Burr, 1910, from Ceylon, which differs in the characters of the head, eyes, penultimate sternite, and in not having a finger-like process in the distal lobe.

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SOME NEW SPECIES OF LYMANTRIIDAE FROM AFRICA.

By C. L. Collenette.

This paper comprises descriptions of new Lymantriidae recently very kindly presented to the British Museum (Natural History) by the collectors. The interesting pair of *Rhypopteryx syntomoides* was sent for description by Professor Dr. E. M. Hering; the types have been returned to the Zoologisches Museum, Berlin.

The occurrence of five new species at Port Harcourt, on the south coast of Nigeria, is somewhat surprising, although the *Eala* may have been overlooked previously on account of its small size. Mr. MacNulty informs me that they were all taken at ordinary electric light overlooking native owned semi-cultivated bush, with a wide creek containing mangroves and water plants.

Olapa jacksoni sp. n. (Plate I, fig. 6).

Male.—Palpus and legs pinkish-buff, fore and middle legs marked on tibiae and tarsi, mainly on inner side, with fuscous. Antennal shaft pinkish-buff mixed with fuscous, pectinations fuscous. Head and body light buff to pinkish-buff, the type having some admixture of ochraceous buff on the head. Wings semi-hyaline whitish, the veins, covered with white scales, standing out prominently; costa of fore wing beneath narrowly edged with fuscous, just visible on upper side; in the angle formed by vein 2 of the fore wing with the cell, a hair brown spot, almost round, without clear-cut edges; fringes white.

Female.—Resembles the male, antennal shaft entirely fuscous.

Expanse.—♂ 41–43 mm., ♀ 45–49 mm.

Uganda: Masaka District, Sango Bay, Katera, 3 ♂, 5 ♀ (including holotype and allotype), iv, xi, xii, 1954–56 (*T. H. E. Jackson*).

O. jacksoni can be separated from *O. phaeospila* Collenette, 1953, by the more transparent wings and more prominent veins, and also by the much smaller spot on the fore wing in the angle of vein 2 with the cell, not occupying the whole of the area between the origin of veins 2 and 3. In *O. leptomita* Collenette, 1931, the wings are whiter, the veins not prominent and the spot still smaller, black and not drab or hair brown. These differences, and others, are constant and do not vary, and the male genitalia show small contrasts which appear to be specific.

Three females of *O. jacksoni* possess an areole, while in one male and one female veins 6 and 7 in the hind wing are on a short stalk, these two veins being slightly separated at their base in the remaining two males and four females. In *O. phaeospila* the venation is also variable, as mentioned in the description of that species.

Eala lasia sp. n. (Plate I, fig. 8).

Male.—Palpus, antenna, legs, head and body cinnamon-buff to tawny-olive. Fore wing cinnamon-buff, the whole of the median part of the wing, between antemedial and postmedial, with violet iridescence when viewed obliquely. A rather broad whitish

antemedial fascia, bowed, concavity basad; an indistinct whitish postmedial fascia, parallel with the termen; some white in the subterminal area, particularly at the tornus; fringe cinnamon buff, white at the vein-ends. Hind wing and fringe, above and beneath, light buff, veins darker in the terminal area of upperside. Underside of fore wing with markings faintly reproduced from above, but without iridescence.

Expanse.—18–19 mm.

Nigeria: Port Harcourt, 2 ♂ (including type), i and viii.1955 (*B. J. MacNulty*).

This species runs down readily to *Eala*, 1937 in the key (Collenette, 1955), but vein 6 in the fore wing, while originating from well below the upper angle of the cell, is further from vein 5 than is the case in the type species of this monotypic genus. The pectinations of the antenna are further apart than is usual in the Lymantriidae and the whole of the fore wing, the costal area in particular, is covered in a thick growth of fine hair-scales. The species has perhaps been overlooked previously on account of its small size.

Synogdoa burgessi sp. n. (Plate I, fig. 3).

Female.—Palpus, legs, antennal shaft, head and body entirely ochraceous-buff to orange-buff, pectinations of antenna Saccardo's umber. Wings semi-hyaline, the sparse hair-scales on upper and undersides ochraceous-buff, the costal area of fore wing and anal area of hind wing more heavily scaled; a very small black spot on the centre of the discocellulars on upperside; fringes ochraceous-buff.

Expanse.—45–46 mm.

Uganda: Entebbe, 2 ♀ (including type), vi and ix.1954, at M.V. lamp (*J. A. Burgess*).

Aurivillius described the genus *Synogdoa* in 1904 for *S. simplex*, represented by a single female from the Cameroons. I have seen a photograph of the type, and there is a further female in the British Museum from Warri, Nigeria. These two females have a single rather large black spot at the centre of the discocellulars and wings so transparent that the venation can be readily seen. The present species has precisely similar venation, but a much smaller discocellular spot and wings only semi-hyaline, so that the venation in the apex of the fore wing can be seen only with difficulty with a lens. The males of both species are unknown, but may well follow closely on the lines of the female, with vein 8 of the hind wing fused for a long distance with the upper median.

Mr. Burgess is to be congratulated on separating this insect in the field from the very similar and common *Cropera testacea* Walker, and determining its genus. It rests in life with wings flat, rather than like a tent as in *C. testacea*, and was resistant to cyanide fumes for over half-an-hour.

Euproctis ionthada sp. n. (Plate I, fig. 1).

Male.—Palpus bistre. Legs white, inner side of fore tibia bistre. Antennal shaft white, the pectinations mars yellow. Eye bordered with bistre, otherwise head and body white. Wings and fringes, above and beneath, pure white; costa of fore wing beneath narrowly fringed with bistre; an almost round orange rufous spot at the centre of the discocellulars; seven interneural orange rufous spots subterminally, one below vein 8; one, small and nearer termen, below vein 7; one, large, below vein 6; two, very small and near termen, below veins 5 and 3; one on each side of anal vein, large and closely approximated.

Expanse.—45–46 mm.

Uganda : Ruwenzori, Nakitawa, thick forest, 8700 ft., 2 ♂ (including type), x.1924 (*R. Gunnis*).

The hair-scales of the head, body and anal area of the hind wing are denser and more upstanding than usual, giving a rather shaggy appearance. The species somewhat resembles *E. sericaria* (Tams), 1924, of Kenya, which is smaller, with wings of tilleul buff and with no bistre on the costa of the fore wing. The genitalia are abundantly distinct.

Dasychira hypnotoides sp. n. (Plate I, fig. 4).

Male.—Palpus sayal brown, on the outer side snuff brown. Antennal shaft sayal brown, the pectinations darker. Legs pinkish-buff, mixed on foreleg with snuff brown. Head and body sayal brown, patagium distally white, dorsal tufts of bistre on basal segments of abdomen. Fore wing with ground colour biscay green ; costa narrowly tawny olive ; a rather faint antemedial fascia composed of one or two tawny olive lines, almost straight, running at right-angles to the inner margin ; a border of snuff brown to the discocellulars ; a faint tawny olive postmedial fascia, crenate, points on the veins, concavities terminad ; distal third of wing mainly tawny olive with an irregular subterminal fascia of snuff brown, ending in a patch of that colour above the anal vein ; a dark preterminal fascia, broken at the veins ; fringe snuff brown, sayal brown between the vein-ends. Hind wing above and beneath, underside of fore wing, and fringes, light buff to pinkish-buff.

Expanse.—33–35 mm.

Gold Coast : Bibianaha, 700 ft., 1 ♂ (type), xii.1911 (*H. G. F. Spurrell*) ; Takwa, 1 ♂ (*R. E. James*) ; Juaso, at light, 1 ♂, ii.1937 (*G. S. Cansdale*) ; Belgian Congo : Luluaburg, 1 ♂, viii.1955 (*Charles Seydel*).

This species, with a green fore wing, is near to *D. likilembae* Aurivillius, 1925 (8 ♂, 2 ♀ in British Museum (Nat. Hist.)), and to *D.* (*Notohyba*) *muscosa* (Holland), 1893 (5 ♂, 1 ♀ in British Museum (Nat. Hist.)). *D. likilembae* has a long slender uncus and a massive single clasp ; *D. hypnota* a short broad uncus and a long rather slender and bluntly pointed clasp. *D. hypnotoides*, described above, has a short broad uncus and a clasp with a broad apex and an inwardly pointing projection distally. The antemedial fascia on the fore wing of *D. hypnotoides* is almost straight, less crenate than in the other two species, while a conspicuous white patch in the anal angle of *D. likilembae* and *D. hypnota* is absent or small in the new species. All three of these species occur in the Belgian Congo and appear to be distinct.

Dasychira macnultyi sp. n. (Plate I, fig. 5).

Male.—Palpus white, on the outer side bistre. Legs whitish, with an admixture of bistre on the tarsi. Antennal shaft whitish, with a prominent spot of bistre at two-thirds, pectinations sudan brown. Head and thorax whitish mixed sparsely with bistre ; abdomen whitish, grading distally to tawny olive, and with dorsal tufts of bistre on basal segments. Fore wing (*see* illustration), with markings and colour much as in *D. eudela* Collenette, 1954, but with less dark irroration on the fore wing in the basal third and the postmedial and subterminal fasciae more deeply crenate. Hind wing raw sienna, darker in the terminal area, fringe whitish, darker between the vein-ends. Fore wing beneath Saccardo's umber, fringe lighter at the vein-ends. Hind wing beneath buckthorn brown, fringe whitish, darker between the vein-ends.

Expanse.—41 mm.

Nigeria : Port Harcourt, 1 ♂ (type), xi.1954 (*B. J. MacNulty*).

This species may be placed near to *D. eudela* Collenette, 1954, having very similar markings and genitalia, but a coloured hind wing and underside in place of white. *D. macnultyi* bears an astonishing resemblance in colour and markings to the very common *D. grotei* Moore, 1859, of India and China. This resemblance is more apparent than real, as the genitalia show no more than generic resemblance.

Dasychira emphanipoda sp. n. (Plate I, fig. 12).

Male.—Palpus and legs light buff, outer side of palpus fuscous black. Fore and mid tarsi with conspicuous fuscous black scales, confined on the fore tarsus to the upperside. Antennal shaft light buff mixed with snuff brown, pectinations pinkish-buff. Head, thorax and abdomen pinkish-buff, mixed on the tegula with fuscous black, base of abdomen and dorsal tufts on basal segments bistre. Fore wing sayal brown with markings of snuff brown ; a dark, almost straight, sub-basal fascia ; a dark antemedial fascia, slightly curved, convexity basad ; a patch of light buff on the discocellulars, edged with fuscous black ; an irregular fuscous black postmedial fascia, running below the discocellulars and reaching a point below the origin of vein 2 ; distal half of costal area light buff, with a dark patch before the apex ; a fuscous black subterminal fascia, parallel with the termen ; fringe sayal brown, darker between the vein-ends. Hind wing and fringe, above and beneath, whitish. Underside of fore wing whitish shading in costal area to sayal brown ; fringe as on upper side.

Expanse.—31 mm.

Nigeria : Port Harcourt, 1 ♂ (type), ii.1956 (*B. J. MacNulty*).

The black iridescent scales on the tarsi of the fore and middle legs are reminiscent of those on the legs of *D. phaedropoda* Collenette, 1954, from the Belgian Congo. The latter was named " gleaming feet " in connection with this characteristic. Apart from these scales there appears to be nothing to connect the two species, but I believe that such scales do not occur in any other of the African Lymantriidae.

Dasychira astraphaea Collenette, 1931.

This species has been represented in the collection of the British Museum (Natural History) by four females from the Gold Coast and one from the Cameroons.

Two males which have now come to hand are less boldly marked. The prominent white line from apex to base of the fore wing, in allusion to which the species is named, is present in the male, but coloured tawny olive against the ground colour of Saccardo's umber. The other wing markings are all present, but equally inconspicuous.

Expanse.—♂ 29–31 mm.

S. Nigeria : Lagos, 1 ♂ (neallotype) and Ilobi, 50 miles north of Lagos, 1 ♂, both ix.1955 (*J. Boorman*).

Rhypopteryx tylota sp. n. (Plate I, fig. 2).

Male.—Palpus, legs, antenna, head and thorax sayal brown to drab ; base of antennal shaft and femur of fore leg marked with peach red. Anal tuft and basal segments of abdomen drab, the remainder ochraceous-buff. Wings above and beneath, and fringes, drab ; fore wing having discocellulars narrowly marked with peach red and a few scales of

the same colour at the base of the anal vein ; between the base of the anal vein and the lower median, a small black boss bare of scales ; below the origin of vein 2 a dark patch edged proximally and distally with white ; some rather faint whitish interneural markings in the apical and subterminal areas.

Female.—Resembles the male, but the area below the origin of vein 2 in the fore wing has an extensive patch of white, reaching the inner margin, containing 5–8 equidistant drab spots. In this sex, present also but less evident in the male, are numerous small tufts of white scales at regular intervals on the veins of the fore wing. These tufts are present in several allied species.

Expanse.—♂ 26–27 mm., ♀ 39–47 mm.

Nigeria : Port Harcourt, 1 ♂ (holotype), xii.1954 (*B. J. MacNulty*) ; Warri, 1 ♂, 1 ♀ (including allotype), vi.1897 and ii.1896 (*Dr. Roth*) ; Forcados, 1 ♀, xi.1899 (*Dr. Ansorge*). Belgian Congo : Upper Kasai, 1 ♀ (*P. Landbeck*).

P. tylota is nearest to *R. preissi* Schültze, 1934, but much smaller, with dark hind wings in both sexes.

Rhypopteryx syntomoides sp. n. (Plate I, figs. 10 and 11).

Male.—Palpus, antenna and legs clove brown. Head and thorax clove brown, with a ring of capucine yellow at base of antenna and a few hair-scales of the same colour at base of fore wing. Abdomen clove brown, capucine yellow dorsally with a dark spot on each segment. Wings and fringes, above and beneath, olive-brown to clove brown, with a spot of capucine yellow on the discocellulars of the fore wing ; a lighter patch, best seen with a lens, in the costal area towards the apex. Some scaleless patches on both wings are not quite symmetrical and are no doubt due to accidental damage.

Female.—Palpus, antenna, legs, head and thorax coloured as in male, but the yellow at base of antennae much paler. Abdomen cinnamon brown, dorsally antimony yellow. Basal two-fifths of fore wing whitish, with 4 rounded olive-brown spots below the cell near the base ; remainder of wing, and fringes, olive-brown, with a whitish crenate post-medial fascia, the costal portion broad and almost square. Hind wing and fringe rather thinly scaled, olive-brown, inner marginal area warm buff. Underside of both wings much as on upperside.

Expanse.—♂ 21 mm., ♀ 25 mm.

Tanganyika Territory : Morogoro, Mikessebei, 1 ♂, 1 ♀ (holotype and allotype) (*Janensch*). In Zoological Museum, Berlin.

The above male and female, taken *in copula*, are of considerable interest. The markings of a male in this genus are usually so close to those of the female that its identity can be recognized. In the present case, the wing markings of the female are strongly reminiscent of those in *R. poecilanthes* (Collenette), 1931, a much larger insect with broader wings, but the male is so different that no single marking is duplicated, while the wing shape is quite misleading and resembles that of a Syntomid. The structure, however, shows that there has been no chance pairing of unrelated forms. This is perhaps paralleled by six or eight different specimens of the same genus in the British Museum collection, mostly undescribed, in which there is at present no clue to the opposite sex.

Rhypopteryx phoenicopoda sp. n. (Plate I, fig. 7).

Male.—Palpus, legs and head peach red to scarlet with an admixture of snuff brown. Antenna bistre. Thorax and basal segments of abdomen whitish, remainder of abdomen

cinnamon-buff dorsally, peach red laterally and ventrally. Fore wing with ground colour whitish ; a small spot of peach red at the centre of the discocellulars ; markings of Saccardo's umber as follow : a patch antemedially from costa to lower median, thence curved (convexity basad) to inner margin ; a crenate postmedial fascia, points on the veins (convexity basad) joining the antemedial at the inner margin ; vein 2 coloured narrowly throughout its length ; some faint markings in the apical area ; fringe whitish, Saccardo's umber interneurally, this colour invading the wing area. Hind wing and fringe, also underside of both wings and fringes, light buff ; costa of both wings beneath edged prominently with peach red.

Expanse.—30 mm.

Nigeria : Port Harcourt, 1 ♂ (type), xii.1954 (*B. J. MacNulty*).

R. phoenicopoda may be near to *R. ganymedes* (Hering), 1926, from Tessmann M.S. The type of the latter, from the Cameroons, has not been examined, but judging from the brief description and the illustration the two are quite distinct.

Rhypopteryx perfragilis sp. n. (Plate I, fig. 9).

Male.—Palpus snuff brown. Antennal shaft tilleul buff, pectinations bistre. Legs sayal brown, tibia and tarsus of fore leg bistre. Head and body tawny olive, with some sparse whitish scaling dorsally on the abdomen. Fore wing and fringe light buff, markings snuff brown to tawny olive, continued on to the fringe ; middle third of discocellulars orange-buff, edged narrowly with bistre ; markings (see illustration) consisting mainly of 3 fasciae across the wing, crenate, concavites terminad, points on the veins, the veins also coloured. Hind wing and fringe, above and beneath, pale pinkish-buff to whitish, unmarked. Fore wing beneath as on upperside, but without the orange-buff on the discocellulars.

Expanse.—31 mm.

S. Nigeria : Lagos, 1 ♂ (type), ix.1955 (*J. Boorman*).

In the British Museum (Natural History) is the water colour painting of a male *Rhypopteryx*, minus the head, with a note in Sir George Hampson's writing "*Alpenus perfragilis*, W. Africa, Holland ". A search through Holland's published species was fruitless. The insect from which the painting was copied is now in the Carnegie Museum, Pittsburgh, and Mr. Harry K. Clench has very kindly informed me that it bears labels reading " Lymantriadae, Bule Country, not in B.M. or Berlin, Alpenus perfragilis Holl., sp. nov., nondum descripta ". The male described above, from Southern Nigeria, matches very well with the painting and, seeing that Holland's specimen lacks the head and is nearly destitute of scales, I have adopted for the present insect the name suggested by him. It will be seen from the illustration that the markings near the centre of each fore wing are not completely symmetrical, which is not infrequently the case with insects of this genus.

Aclonophlebia disparina Hering, 1926.

The type of this species, labelled " Transvaal ", is in the Maassen collection of the Berlin Museum. It proves to be a male of *Lymantria ampla* Walker, of Ceylon and India, and *A. disparina* is now synonymised. This is the second instance of an erroneous label from the Maassen collection, as *Laelia croperoides* Hering was found to originate from Australia and not from Madagascar (*see* 1955, *Nat. Malgache* **7** (2) : 179).

Some new Lymantriidae from Africa

C. L. Collenette.

Adlard & Son, Ltd., Dorking.

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PLATE I.

Fig. 1.—*Euproctis ionthada* sp. n., holotype ♂.
Fig. 2.—*Rhypopteryx tylota* sp. n., holotype ♂.
Fig. 3.—*Synogdoa burgessi* sp. n., holotype ♀.
Fig. 4.—*Dasychira hypnotoides* sp. n., holotype ♂.
Fig. 5.—*Dasychira macnultyi* sp. n., holotype ♂.
Fig. 6.—*Olapa jacksoni* sp. n., holotype ♂.
Fig. 7.—*Rhypopteryx phoenicopoda* sp. n., holotype ♂.
Fig. 8.—*Eala lasia* sp. n., holotype ♂.
Fig. 9.—*Rhypopteryx perfragilis* sp. n., holotype ♂.
Fig. 10.—*Rhypopteryx syntomoides* sp. n., allotype ♀.
Fig. 11.—*Rhypopteryx syntomoides* sp.n., holotype ♂.
Fig. 12.—*Dasychira emphanipoda* sp. n., holotype ♂.

A NEW SPECIES OF AGROMYZIDAE (DIPTERA) FROM BRITAIN.

By Kenneth A. Spencer.

Allen (1956) referred to breeding *Ophiomyia maura* (Mg.) from *Heracleum sphondylium* L. *O. maura* has long been accepted as being a monophagous leaf-miner on *Solidago virgaurea* L., and Allen's record therefore immediately appeared suspect to the author.

Quite independently I myself discovered *Ophiomyia* puparia in the base of rotting leaves of *Heracleum sphondylium* L. in November, 1956, at Bookham, Surrey. It was clear from the black puparia that the species could not be *O. maura*, and examination of a fly which emerged on 8th February, 1957, showed that the species is new to science. Dr. Allen has kindly allowed me to examine four of her bred specimens which agree exactly with mine.

Ophiomyia heracleivora sp. n.

A species with broad jowls, with vibrissal angle of 80 degrees, closely related to *O. melandryi* de Meij.

Head (fig. 1): Frons and foremost ocellus twice width of eye, slightly projecting above eye in profile. Orbits not greatly differentiated; 2 equal upper orbital bristles directed upwards; 2 equal lower orbital bristles, slightly weaker, directed inwards and upwards; orbital setulae all reclinate, from below lower orbital bristles to above upper orbitals. Ocellar triangle not conspicuous, extending to midway between upper orbital bristles. Lunule sunk below plane of frons, slightly higher than a semicircle, flattened above. Cheeks prominent below eye, extending to midway between eye and margin of jowl. Lower margin of jowl straight, horizontal, vibrissal corner forming angle of approximately 80 degrees. Jowls and cheeks one quarter height of eye. Facial keel widening below base of antennae but not appreciably raised, normally shallow declivity from widest point up to margin of lunule. Very narrow epistoma present. Male with vibrissal horn.

Mesonotum: two dorsocentral bristles, the second at level of supra-alar. Strong intra-alar present. Acrostichals regular in 8 rows.

Wing (fig. 2): Length, male 2·6 mm., female, 2·7 mm. Costa extending to *m* 1 + 2. Last segment of *m*4 shorter, the two segments in ratio 4 : 5.

Colour: Vertical triangle and orbits only very faintly shining black. Remainder of head matt black. Mesonotum predominantly matt black, with very slight trace of subshine, abdomen more shining. Squamal fringe dark grey, margin of fringe black.

The species runs to couplet 7 in Hendel's Key (1936) which (as already amended by Hering, 1949) should be further extended as follows:

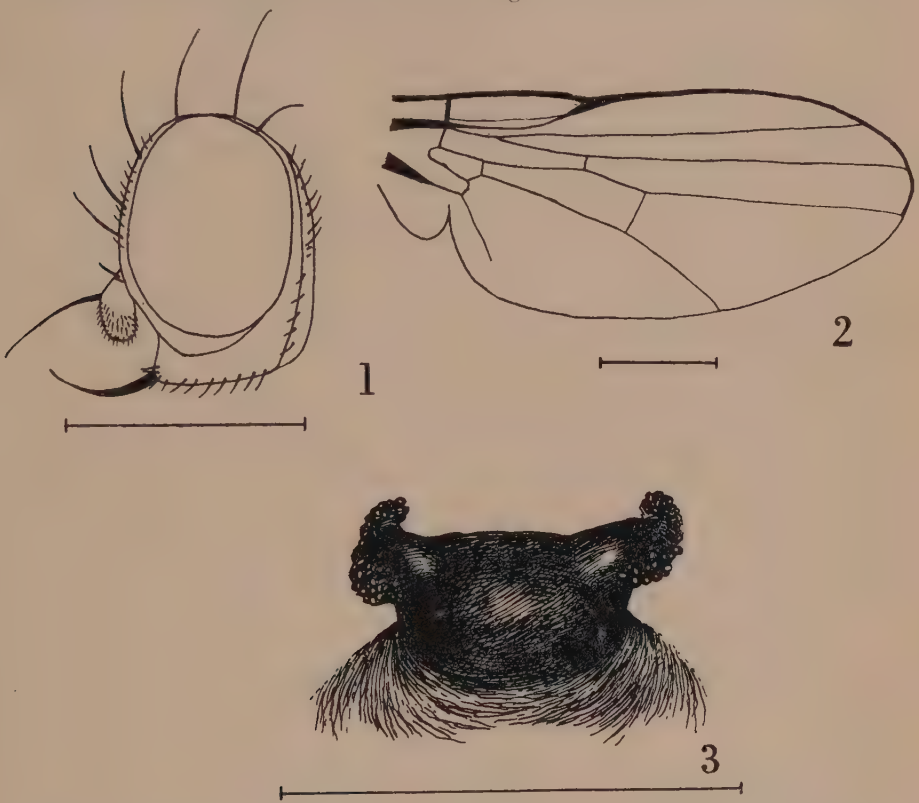
7	Stirn oben 2mal so breit wie ein Auge, Wangen im Profil als schmaler Streifen vor dem Auge sichtbar. Kopfunterrand waagerecht. Letzter m4 Abschnitt kürzer als der vorletzte	7aa
–	Stirn schmaler, Wangen im Profil nicht sichtbar. Kopfunterrand vorn tiefer nach unten reichend als hinten. Letzter m4 Abschnitt so lang wie der vorletzte	7a
7aa	♂ ori (mindestens auf einer Seite), Gesichtskiel unter den Fühlerwurzeln stark hervorragend. Wangen unter den Augen über die Hälfte der Backen tief. Puparium gelb	**melandryi** de Meijere

– 2 ori, Gesichtskiel unter den Fühlerwurzeln breit aber nicht hervorragend, Wangen höchsterns die Hälfte der Backen tief. Puparium schwarz . . . . . **heracleivora** sp. n.

Holotype ♂, SURREY : Bookham Common, emerged 8.ii.1957 from puparia collected 17.xi.1956 (*K. A. Spencer*). In author's collection.

Paratypes 2 ♂, 29.i.1952, 2 ♀, 2.xii.1951 and 4.ii.1952, all ex *Heracleum sphondylium* L. (*P. Allen*). In collection of the University, Glasgow.

The species very closely resembles *O. melandryi* de Meij. (de Meijere, 1924, 1925) but differs in having only two lower orbital bristles, in the narrower cheeks below the eye and in the less bulbous facial keel below the antennae ; the mesonotum is also somewhat less shining.



FIGS. 1–3.—*Ophiomyia heracleivora* sp. n. (1) Head. (2) Wing. (3) Posterior spiracular processes of puparium. Scale line = 0·5 mm.

The matt black puparium of the new species is 3·4 mm. long and 1·2 mm. wide. The posterior spiracles (fig. 3) each consist of a double-armed ellipse of 30–40 buds, arranged very irregularly, arising from each side of a blunt, slightly tapering projection at the end of the puparium.

I am indebted to Dr. Kruseman of the Zoological Museum, Amsterdam, for kindly allowing me to examine the type of *O. melandryi* de Meij. and to Mr. H. Oldroyd for reading and commenting on my manuscript.

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SOME SANDFLIES (PHLEBOTOMINAE) OF MALAYA.

By D. J. Lewis.[1]

(*Scientific Staff, Medical Research Council*).

According to Causey (1938) sandflies are comparatively rare in the Malayan peninsula although members of several other genera of Nematocera are abundant. Phlebotominae are often rare in forest country, and, until recently, only two species (mentioned below) were known from the Federation of Malaya. Seven additional ones (three new species and one new subspecies) which were obtained during intensive collecting of mosquitoes, are now recorded. Reid (1957) has described the circumstances under which most of them were caught, and the following are short notes on all the Malayan collections referred to below.

Pahang State: (1) Kuantan (Lamir), i.56 (*R. H. Wharton*), in box traps for mosquitoes, used during study of filariasis, (2) the same, 10.ii.56, (3) Lubok Paku, 5.iv.56 (*R. H. W.*), hollow tree.

Selangor State: (4) Batu, 7.xi.41, blue light trap, (5) Kuala Lumpur, 1913 (*A. T. Stanton*) (Reid, 1957), (6) Rantau Panjang, vi.56 (*R. Traub*), round cow at night, (7) the same, 11.ix.56, light traps behind mangrove swamps, (8) the same as no. 7, 19.ix–11.xii.56, (9) near Kuala Lumpur, x.35 (*A. G. Pillai*), 7th mile rubber estate (Theodor, 1938), (10) Ulu Gombak, ii.56, (*R. T.*), 16th mile, forest at 1000 feet, caught with human bait (not necessarily biting), (11) the same, iii.56, (12) the same, xii.56 and i.57, in light traps.

Holotypes are in the British Museum (Natural History). The descriptions follow the form described in Kirk and Lewis (1951). The illustrations of new forms include figures of the second abdominal sternite which Hertig and Fairchild (1950) found to be of taxonomic value in some American species.

Phlebotomus (*Phlebotomus*) *argentipes* Annandale and Brunetti.

Some particulars of the available specimens are as follows:

Female (10 measured).—*Antenna:* III 0·24 (0·22–0·25) mm. > IV + V (0·21, 0·20–0·22 mm.), AIII/E = 1·1 (1·00–1·14) formula 2/III–XV, ascoid on IV 0·75 length of segment and overlapping V; papillary formula 1/III–IV. *Palp:* formula 1, 4, 2, 3, 5, relative lengths 1, 2·6, 3·8, 1·8, –. *Mesonotum:* middle and anterior parts dark. *Wing:* length 2·16 (2·03–2·31) mm., width 0·63 (0·58–0·68) mm., index 1·37 (1·0–2·2), delta + 0·09 (0·07–0·10) mm.

Male (5 measured).—*Antenna:* III 0·247 mm. > IV + V (0·227 mm.), AIII/E = 1·35, formula 2/III–X, more distal ascoids very thin and not clearly seen, ascoid on IV 0·62 length of segment; papillary formula 1/III–IV. *Palp:* formula 1, 4, 2, 3, 5, relative lengths, 1, 2·3, 3·6, 1·9, –. *Mesonotum:* as in female. *Wing:* length 1·99 mm., width, 0·54 mm., index 1·7–2·3, delta + 0·07 mm.

[1] Care of the British Museum (Natural History).

The specimens show little difference from the descriptions of Indian *P. argentipes* by Sinton (1925) and Mitra and Roy (1953) except that in the Malayan ones of both sexes the third antennal segment and the ascoids on the fourth are longer. The ascoids are also long in *P. argentipes* in Indochina according to Raynal (1935).

Localities.—Kuantan : Collection no. 1, 3 ♂, 14 ♀ ; coll. 2 (including those measured), 5 ♂, 34 ♀. Rantau Panjang : Coll. 6, 8 ♂ ; coll. 8, 1 ♂, 1 ♀. Ulu Gombak : Coll. 10, 1 ♂ ; coll. 11, 1 ♀.

Dr. J. A. Reid informs me that Mr. B. Weitz of the Lister Institute has tested blood smears from 373 specimens ; 348 had fed on cattle, and five on an unidentified mammal, and 20 were negative.

Phlebotomus (*Phlebotomus*) *stantoni* Newstead.

Localities.—Batu : 1 ♂. Kuala Lumpur : 1913 (Reid, 1957). Rantau Panjang : Coll. 8, 1 ♂.

Phlebotomus (Sergentomyia) zeylanicus malayae subsp. n. (Fig. 1).

Female.—Antenna : III 0·37, 0·35 mm., > IV + V, AIII/E = 0·82, 0·82, formula 2/III–XV, ascoids on IV 0·8 length of segment ; papillary formula 1/III–IV. *Palp :* formula 1, 4, 2, 3, 5 in each case. *Cibarium :* in each case with about 14 teeth, two rows of anterior nodules, and a third row on each side. *Wing :* length 2·21, 2·27 mm., width 0·63, 0·65 mm., index 1·35, 1·30, delta + 0·32, 0·37 mm. *Spermatheca :* a thick-walled capsule.

Male.—Unknown.

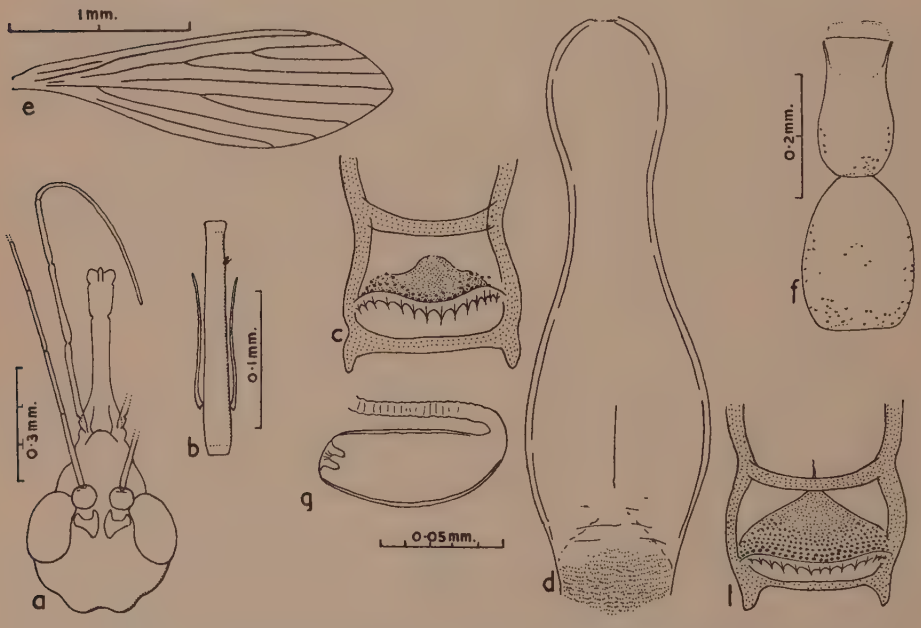

FIG. 1.—*Phlebotomus zeylanicus malayae* subsp. n. ♀: (*a*) head, (*b*) fourth antennal segment, (*c*) cibarium, (*d*) pharynx, (*e*) wing, (*f*) anterior abdominal sternites, (*g*) spermatheca *Phlebotomus* sp., probably a variant of *P. z. malayae*, ♀ : (*l*) cibarium.

This form differs from specimens from Ceylon, described by Theodor (1938), in the AIII/E ratio, the palpal formula and the wing index.

Locality.—Ulu Gombak : Coll. 10, holotype ♀ and 1 paratype ♀.

A related form.—In a female from the same collection the anterior buccal nodules are much more numerous and the pigmented area broader (fig. 1, *l*). Some other features are as follows :

Antenna : III 0·39 mm., AIII/E = 0·84. *Palp :* formula 1, 2, 4, 3, 5. *Wing :* length 2·10 mm., width 0·63 mm., index 1·52, delta + 0·32 mm. *Spermatheca :* with one or two faint transverse striations.

This sandfly may be a subspecies of *P. arboris* Sinton but, in view of possible variation in the buccal structure, it is desirable to examine more specimens before deciding its status.

Phlebotomus (*Sergentomyia*) *silvaticus* Raynal and Gaschen or a Related Form.

A single male is provisionally assigned to this species.

AIII/E ratio 1·9, ascoid on IV 0·23 length of segment. Posterior end of pharynx more curved than in the figure by Raynal and Gaschen. Wing index 0·83 and delta + 0·14 mm.

Locality.—Rantau Panjang : Coll. 8, 1 ♂.

Phlebotomus (Sergentomyia) whartoni sp. n. (Fig. 2).

Female.—Antenna : III 0·35 mm. in both specimens, < IV + V, AIII/E = 1·53 in both, formula 2/III–XV, ascoid on IV 0·33 length of segment, papillary formula 1/III–IV. *Palp :* formula 1, 2, 4, 3, 5. *Cibarium :* with 8 distinct pointed teeth and a few indistinct small ones on each side ; pigmented area pale with indistinct radial striations, indistinct anterior prolongation separated from main part of the area by a line which is concave anteriorly. *Pharynx :* less than twice as wide posteriorly as anteriorly, with faint ridges bearing minute denticles. *Wing :* length 2·27, 2·24 mm., width 0·63, 0·58 mm., index 0·75, 0·64, delta + 0·17, 0 mm. *Spermatheca :* a capsule with transverse striations.

Male.—Antenna : III 0·52 (0·51–0·53) mm., < IV + V, AIII/E = 2·75 (2·60–2·85) ; papillary formula 1/III–IV. *Palp :* formula 1, 2, 4, 3, 5. *Cibarium :* with 8 conspicuous but delicate teeth and a few small ones on each side, no pigmented area. *Wing :* length 1·91 mm., width 0·47 mm., index 0·53–0·69, delta + 0·08 mm. *Terminalia :* coxite narrow with the hairs on the interior ventral surface, near the base, concentrated and rather long so that they form a conspicuous brush-like bunch ; style narrow with two spines at tip and two at 0·6, small ventral seta at 0·7 ; paramere hooked ; aedeagus small, straight and bluntly pointed.

P. whartoni is rather like *P. sylvestris* Sinton (described by Sinton, 1924 ; Nitzulescu, 1930 ; Raynal, 1935 ; and Parrot and Clastrier, 1952) and differs from it mainly in the smaller number of buccal teeth, the lack of rectangular markings on the pigmented area of the female, the small wing index and the presence of a bunch of hairs on the coxite of the male.

Locality.—Lubok Paku : holotype ♀ and 3 ♂ and 1 ♀ paratypes.

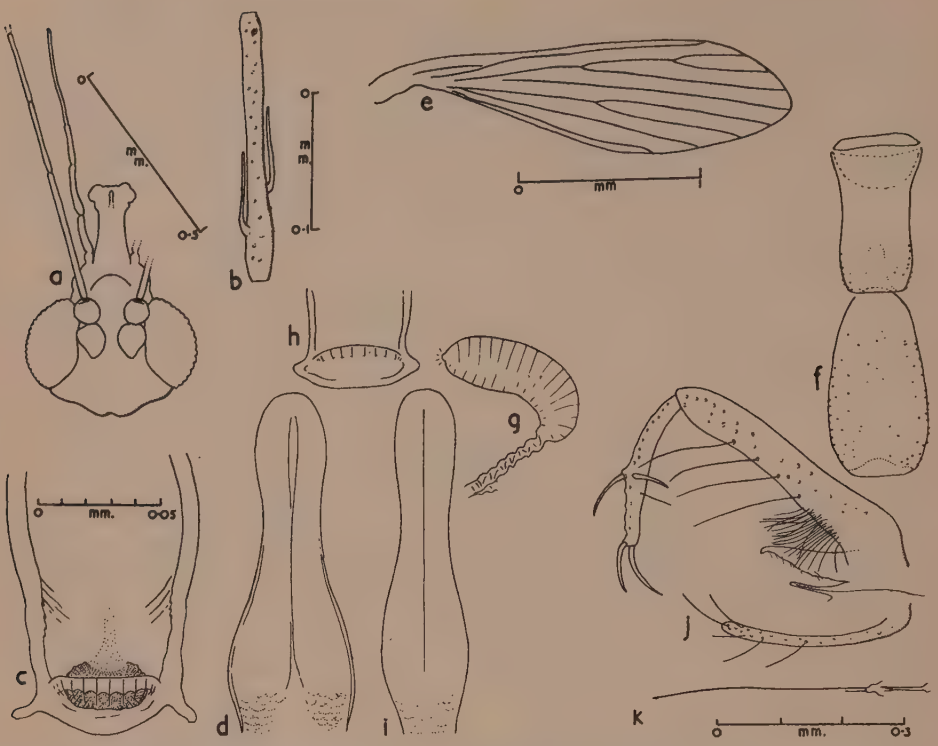

FIG. 2.—*Phlebotomus whartoni* sp. n. ♀: lettering as in figure 1. ♂: (*h*) cibarium, (*i*) pharynx, (*j*) terminalia, (*k*) genital pump and filament.

Phlebotomus (*Sergentomyia*) *iyengari* var. *malayensis* Theodor.

Some particulars of two females from the Ulu Gombak area as follows:

Antenna: III 0·26, 0·23 mm., > IV + V, AIII/E = 1·37, 1·31, ascoid on IV 0·76 length of segment and reaching its tip; papillary formula 1/III–IV. *Palp:* formula 1, 2, 3, 4, 5. *Wing:* length 1·92, 1·79 mm., width 0·54, 0·41 mm., index 1·55, 1·45, delta + 0·30, 0·28 mm. *Spermatheca:* as in original description.

Localities.—Near Kuala Lumpur (Theodor, 1938). Ulu Gombak: Coll. 10, 2 ♀.

Phlebotomus (*Sergentomyia*) *squamipleuris* var. *indicus* Theodor.

The pointed pharyngeal teeth, mentioned in the description of the male by Parrot and Clastrier (1952), could be seen in some Malayan specimens.

Locality.—Rantau Panjang, coll. 7, 15 ♂, 4 ♀; coll. 8, 11 ♂, 10 ♀.

The finding of this sandfly in light traps in Malaya was to be expected in view of its known distributions and habits. *P. squamipleuris*, or its varieties, is widely distributed in Africa and Asia and is often attracted to lights. For instance, in the Sudan it often comes to light in many areas, and in Iraq Pringle (1952) has taken many around lights at Baghdad. In India it is widely distri-

buted (Causey, 1938 ; Mitra and Roy, 1954), and in Siam Sinton (1931) found *P. s.* var. *indicus* at lights on trains at various places, and Causey stated that it was the most abundant species in Bangkok. In China Yao and Wu (1941) reported this variety from Hainan Island, and in Indochina they found it to be abundant round lights at Phnompenh.

Phlebotomus (Sergentomyia) reidi sp. n. (Fig. 3).

Female.—Antenna : III 0·32 mm., > IV + V, AIII/E = 1·9, formula 2/III–XV, ascoids slender, those on IV 0·5 length of segment ; papillary formula 1/III–IV. *Palp :* formula 1, 2, 3, 4, 5. *Cibarium :* broad with a row of 22 pointed teeth, the lateral ones small, each tooth with a thick nodular base ; behind the teeth are about 4 rows of curved spicules ; pigmented area narrow, without forward extension. *Pharynx :* lamp-glass shaped and

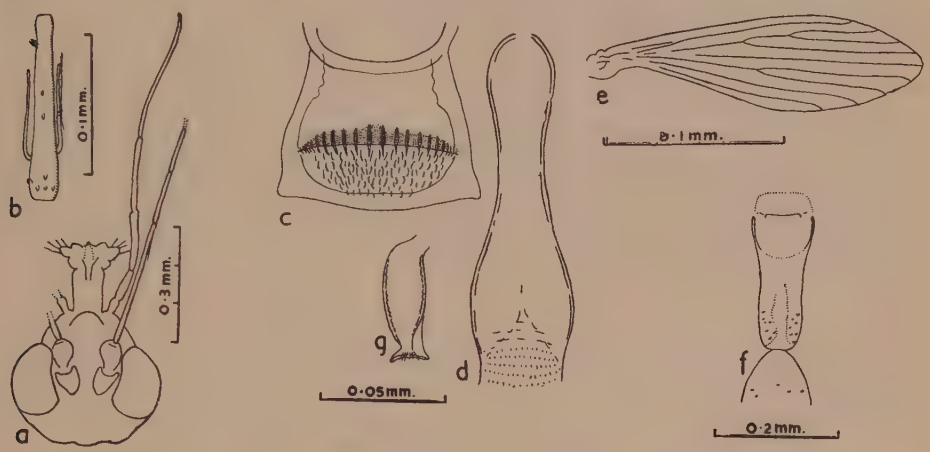

FIG. 3.—*Phlebotomus reidi* sp. n. ♀ : lettering as in figure 1.

much narrower than buccal cavity, with a few posterior ridges and rows of minute spicules. *Wing :* length 1·79 mm., width 0·45 mm., index 1·4, delta + 0·34 mm. *Spermatheca :* a capsule with a wide duct and a well-developed collar which is twisted in the available specimen.

Male.—Unknown.

P. reidi may be placed in Theodor's (1948) group of aberrant species owing to its buccal spicules. These distinguish it from other members of the group, and other unusual features are the breadth of the buccal cavity and the shape of the spermatheca.

Locality.—Ulu Gombak : Coll. 12, holotype ♀.

Phlebotomus (Sergentomyia) traubi sp. n. (Fig. 4).

Female.—Antenna : III 0·31 mm. < IV + V, AIII/E = 2·0, formula 2/III–XIV, ascoids slender, those on IV lying against segment and difficult to see ; papillary formula 1/III–IV. *Palp :* formula 1, 2, 4, 3, 5. *Cibarium :* with 18 longitudinal folds having rounded ends which form a row of tooth-like structures on an arc convex posteriorly ; no pigmented area. *Pharynx :* armed with ill-defined scale-like ridges. *Wing :* length 2·04 mm., 3·9 times width, index 0·8, delta + 0·13 mm. *Spermatheca :* an oval capsule with faint markings.

Male.—Unknown.

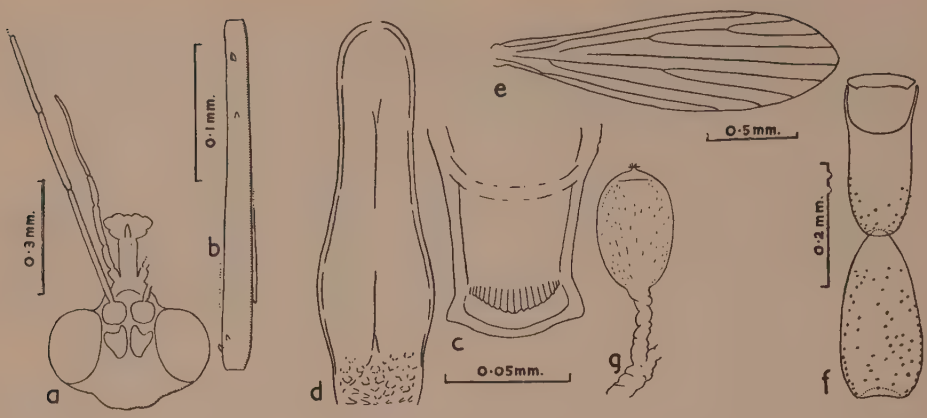

Fig. 4.—*Phlebotomus traubi* sp. n. ♀: lettering as in figure 1.

P. traubi may be placed provisionally in Theodor's group of aberrant species owing to the nature of its buccal armature. The posterior convexity of this armature and the shape of the spermatheca may indicate some affinity with the *P. squamipleuris* group.

Locality.—Ulu Gombak: Coll. 12, holotype ♀.

Summary.

A collection of *Phlebotomus* contained species which bring the total known in the Federation of Malaya from two to nine. Three new species and a subspecies are described.

Acknowledgments.

I am grateful to Dr. J. A. Reid, Senior Entomologist of the Institute for Medical Research, Federation of Malaya, for the opportunity of examining the collection; to Lieut.-Col. Robert Traub, in command of the United States Army Medical Research Unit in Malaya, which collected the specimens from Ulu Gombak and Rantau Panjang; to Mr. R. H. Wharton who collected the specimens from Kuantan and Lubok Paku; and to the Director of the Commonwealth Institute of Entomology for putting some of the material at my disposal.

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TWO NEW THYSANOPTERA FROM THE BELGIAN CONGO.

By J. Douglas Hood.
(Cornell University, Ithaca, N.Y., U.S.A.).

The two species described below were taken by Dr. J. Chester Bradley, now President of the International Commission on Zoological Nomenclature, during the course of an extended collecting trip to Africa in 1948 and 1949. The types are in the author's collection.

Franklinothrips atlas sp.n. (Fig. 1).

Female (macropterous).—Length about 2·1 mm. (fully distended, 2·38 mm.). *Colour* (of single known specimen, which is obviously somewhat teneral) brown in head, thorax, and abdominal segments IX and X, segments I–VIII pale and yellowish, I very lightly

Fig. 1.—*Franklinothrips atlas* sp. n., ♀; head and prothorax, dorsal aspect, holotype; × 138.

shaded at sides, III–VIII lightly shaded along and behind antecostal lines; legs brown, with hind coxae, mid and hind trochanters and tarsi, and both ends of mid and hind femora, yellowish; fore wings brown, with the usual colourless areas near base, at middle, and near apex; antennae clear yellow in segments I–III and in about basal one-thirteenth of IV, their remainders brown but IV somewhat paler and more yellowish. *Head* almost hemispherical in dorsal aspect (fig. 1), about 245 μ long and 461 wide, much broader than pterothorax, otherwise thoroughly normal in structure; eyes typical; median ocellus 14 μ in diameter and 76 from posterior ones; these last 25 μ in diameter and 153 apart. *Antennae* very slender, fully four times as long as head and more than twice as long as its width, the segments measuring as follows, in length (and width), in μ: I 47 (47), II 57 (33–34), III 360 (21), IV 224 (24), V 99 (23), VI 75 (23), VII 64 (23), VIII 56 (18), IX 21 (7). *Prothorax* nearly hemispherical, with a well-defined collar at base, its length 349 μ, its width anteriorly 493 μ, and across basal collar 238 μ. *Mesothorax* 392 μ wide, normal, but with mesonotum much more heavily striate (especially anteriorly) than in allied species, the striae dark and especially distinct posteriorly, but evident even in the area anterior to the pair of major setae; fore wings 1·22 mm. long. *Abdomen* about 672 μ across segment VI, of the usual broad form; segment IX with the three pairs of major setae 249, 255, and 238 μ long, respectively, X with the two pairs 224 and 238 μ.

Holotype ♀, Congo Belge: Bukama, Lualaba R., i.1949 (*J. Chester Bradley*).

This is a very distinctive species, in that the head and prothorax form a compact spherical mass which is much broader than the pterothorax; the mesonotum is much more heavily and extensively striate than in its congeners; and the last two abdominal segments, instead of being paler than the ones immediately in front of them, are darker. Its closest relative is doubtless *F. megalops* (Trybom), a less-specialised form, also African.

Plectrothrips lobatus sp.n.

Female (macropterous).—Length about 2·4 mm. (fully distended, 2·9 mm.). *Colour* yellowish-brown, with segment IX of abdomen paler and yellowish, and sides of pterothorax somewhat darkened; femora nearly concolorous with body, somewhat paler and more yellowish at tip, tibiae and tarsi yellow, mid and hind tibiae slightly shaded basally; fore wings yellowish-brown, with a faint, pale, post-median streak except at base and tip; antennae concolorous with head in segment I, II golden-yellow, III–VII yellowish-brown but with pedicel and tip yellow, VIII nearly yellow but lightly shaded with brown. *Head* more nearly rectangular than usual, scarcely 1·2 times as long as width across eyes, lightly reticulo-striate at sides of base, smooth elsewhere, broadest near anterior ends of cheeks, the latter only slightly convex; total length of head 248 μ, width across eyes 213, just behind eyes 209, across cheeks 216, in front of basal collar 189, across basal collar 195, across head-process 125; postocular setae pointed, 95 μ long, 181 apart, and 37 from eyes; eyes about 93 μ long, 50 wide, 114 apart at level of posterior ocelli; ocelli anterior in position, the median one 24 μ in diameter and with its posterior margin on a line with both the base of the first antennal segment and the anterior margin of the paired ocelli, these latter 30 μ in diameter, 63 apart, and 26 from median ocellus; median ocellus without flanking setae; mouth-cone normal, extending about 113 μ beyond posterior dorsal margin of head. *Antennae* formed as usual in the genus, the lengths (and widths) of the segments as follows, in μ: I 60 (57), II 66 (45), III 69 (47), IV 63 (49), V 57 (40), VI 57 (33), VII 53 (28), VIII 73 (19); major sense-cones very minutely roughened, disposed on inner (and outer) surfaces of segments as follows: III 1 (1), IV 1 (2), V 1 (1), VI 1 (0), VII 1 dorsal. *Prothorax* typical in general structure, its width across coxae about 463 μ; pronotum 203 μ long medially, smooth except for a few faint striae at sides, its median apodeme faint at either end and not attaining posterior margin of pronotum, this last broadly and evenly

arcuate, not emarginate medially; epimeral seta pointed, 127 μ long, coxal 102, other setae minute. *Mesothorax* 406 μ across anterior angles; mesosternum without margining sclerite in front. *Legs* normal in general structure; mid tibiae with one strong spur, hind tibiae with two. *Fore wings* normal; posterior margin with 15–18 accessory setae near tip; sub-basal setae minute and pointed. *Abdomen* formed as usual in the genus; surface smooth except for faint mucronation at sides of terga, this sculpture most distinct on posterior terga, where it is accompanied by a faint reticulation; tergum II with the sub-median pores anterior to, and mediad of, the two minute setae. *Tube* unusually long and slender, about 1·2 times length of head, slightly broadest across basal collar, a trifle concave at basal fourth, narrowed rather abruptly at tip, length 305 μ, width across basal collar 110, width just beyond collar 104, at tip 43, terminal setae 170; segment IX with seta I 224 μ, II 206, III 286; all abdominal setae pointed.

Holotype ♀, Congo Belge: Bukama, Lualaba R., i.1949 (*J. Chester Bradley*).

This is the only species of *Plectrothrips* which has the tube longer than the head. From *atactus* Hood, 1924, the only other African species with one spur, instead of two, on the middle tibiae, it may be additionally distinguished by the broadly rounded and evenly arcuate posterior margin of the pronotum and the short median pronotal apodeme. In *atactus* and most other species of the genus, this apodeme occupies the posterior one-half or more of the median line of the pronotum, and where it fuses with the thickened posterior margin there is usually a shallow emargination. In *lobatus*, the apodeme is confined to the middle of the pronotum and the rear pronotal margin is evenly convex.

ON THE FINAL INSTAR LARVA OF *STILBOPS* (*APHANOROPTRUM*) *ABDOMINALE* (GRAV.) (HYMENOPTERA : ICHNEUMONIDAE).

By J. R. T. Short.

(*Natural History Department, University of Aberdeen*).

Introduction.

Stilbops has long been regarded as a genus of uncertain position from study of the adult characters. Thus Kloet and Hincks (1945) place *Stilbops* and *Aphanoroptrum* in the tribe Acaenitini of the Pimplinae, whilst Townes and Townes (1951) place *Aphanoroptrum* as a synonym of *Stilbops*, the single genus of the Stilbopini, a tribe of the Tryphoninae. Through the kindness of Herr Rolf Hinz I have been able to examine the final instar larva of *Stilbops abdominale* (Grav.) which, Herr Hinz informs me, is an endoparasite of *Adela reaumurella* (L.) (*viridella* (Scop.)).

Larval Characters. (Figs. 1–4).

For the basis of the terminology which is used here reference should be made to Short (1952).

Head sclerites (fig. 1) moderately sclerotised ; epistoma (*epst*) incomplete dorsally and anterior tentorial pits (*at*) inconspicuous ; pleurostoma (*plst*) and hypostoma (*hst*) complete and relatively broad ; hypostomal spur (*hsp*) meets the stipital sclerite (*ss*) in about the middle of this sclerite's length ; stipital sclerite has a lightly sclerotised expansion at its lateral end ; labial sclerite (*lbs*) relatively narrow ; each maxillary and labial palp (*mplp* and *lplp*) with two sensilla, both round, one relatively large and one very small ; silk press (*sp*) moderately sclerotised ; labral sclerite (*lms*) incomplete dorsally ; small bubble-like projections present on skin of head region ; mandible (*md*) relatively large, with a broad base and a long slightly curved blade with a row of fine teeth along dorsal surface of the blade ; setae and sensilla present on labrum (*lm*), maxillae (*mx*) and labium including the prelabium (*prlb*) ; antenna (fig. 2) with a small papillus ; closing apparatus (fig. 3, *ca*) of spiracle separated from atrium (*atr*) by a length of trachea approximately equal to one-third the depth of the atrium ; skin (fig. 4) with very small setae and very small projections.

Systematic Position of *Stilbops* Indicated by Larval Characters.

The larval characters of *Stilbops* do not fit in with those of any other Ichneumonid group. In the key to the subfamilies of the Ichneumonidae given in Short (*in press*), *Stilbops* keys out with those groups having a labral sclerite—the Tryphoninae, Cryptinae and Pimplinae other than the Pimplini and Acaenitini. *Stilbops* has none of the characters listed in the key for the Pimplinae and the form of the mandible with its line of teeth along the dorsal surface of the long blade differs from that of the Cryptinae and Tryphoninae. The dorsal part of the epistoma is unsclerotised in *Stilbops* and unlike that of all Tryphoninae except *Idiogramma*, and *Idiogramma* has long been regarded as a genus of uncertain position. The moderately papilliform antenna and the very small skin setae differ from those of most Tryphoninae. Other differences are that *Stilbops* is an endoparasite whereas the Tryphoninae are ectoparasites, and that the eggs of *Stilbops* are not stalked (Hinz, *in litt.*) whereas those of the Tryphoninae are attached to the host by a stalk or, in some Cteniscini, by other structures.

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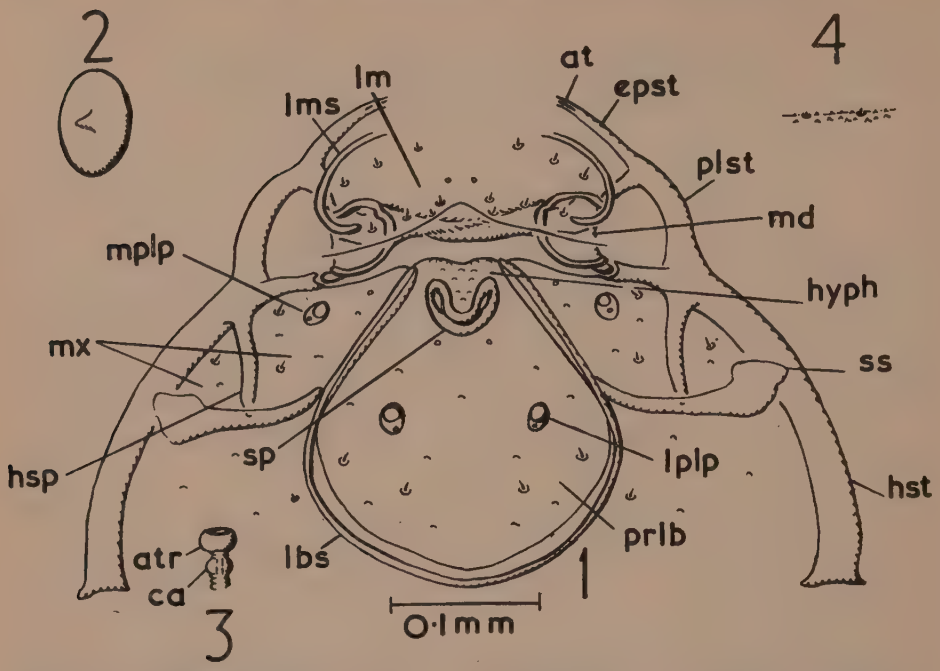

Figs. 1–4.—*Stilbops abdominale* (Grav.). (1) Head sclerites. (2) Antenna. (3) Spiracle (abdominal). (4) Skin (abdominal). *at*, anterior tentorial pit; *atr*, atrium of spiracle; *ca*, closing apparatus of spiracle; *epst*, epistoma; *hsp*, spur of hypostoma; *hst*, hypostoma; *hyph*, hypopharynx; *lbs*, labial sclerite; *lm*, labrum; *lms*, labral sclerite; *lplp*, labial palp; *md*, mandible; *mplp*, maxillary palp; *mx*, maxilla; *plst*, pleurostoma; *prlb*, prelabium; *sp*, silk press; *ss*, stipital sclerite.

The form of the mandible of *Stilbops* is distinctive, the only group of the Ichneumonidae with a similar mandible being the Adelognathinae. There are, however, no other resemblances, the labral sclerite, for example, being absent in the Adelognathinae.

It would therefore appear that, from the standpoint of larval characters, *Stilbops* had best be placed in a subfamily of its own.

Summary.

The taxonomic characters of the final instar larva of *Stilbops abdominale* (Grav.) are described and its systematic position discussed.

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TWO APPARENTLY UNDESCRIBED FEMALE *CHARAXES* (LEPIDOPTERA : NYMPHALIDAE).

By V. G. L. van Someren.

When I wrote my series of papers on the *Charaxes* of Kenya and Uganda in 1927–31 (*J. E. Afr. Ug. nat. Hist. Soc.*, Parts V–X) the females of *Charaxes porthos dummeri* Joicey and Talbot and *Ch. zelica depuncta* Joicey and Talbot were still unknown. Subsequent collecting led to the discovery of both these females, and, since a description of neither has appeared in print in the meanwhile, I now submit a description of these insects. All specimens referred to below are in my own collection.

Charaxes porthos dummeri Joicey and Talbot, 1922.

Female.—Very like the male, but slightly larger (length of fore wing 42 mm.) and with a longish " tail " 5 mm. in length at end of vein 5 of the hind wing.

Upperside.—Fore wing with a double blue spot at end of cell, that nearest the costa small ; the blue band across the wings wider than in the male, especially that of the hind wing, which is 3 mm. wide at the costa and widens towards the inner fold to 9 mm. The submarginal row of white spots complete and more pronounced than in the male. The presence of a marked tail is a distinctive feature, whilst the margin of the wing is more broadly bluish than in the male. The hind wing more rounded at the anal angle.

Underside.—Coloration and pattern similar to that of the male, but white spots on submargin of hind wing larger and more distinct.

Neallotype, Uganda : Masaka district, Katera forest nr. Sango Bay, xi.1956 (*Van Someren*).

Charaxes zelica depuncta Joicey and Talbot, 1921.

Female.—Very similar to the male in coloration but fore wing longer, more falcate, yet more rounded at the apex. Length of fore wing 45 mm.

Upperside.—Blue spotting in fore and hind wings arranged as in the male but spots smaller, especially those of the hind wing. Admargin of hind wing with a series of linear bluish marks from anal angle to 6.

Underside.—As in the male, but duller and lacking the two bold ochreous spots in area 2 of fore wing.

Neallotype, Uganda : Mengo district, Kamengo Mawakota forest, ix.1949 (*Van Someren*).

Paratype, Uganda : Busoga Prov., Jinja, iii.1931 (*Van Someren*).

NOTES ON THE BRITISH SPECIES OF *MELANAGROMYZA* HENDEL (DIPTERA: AGROMYZIDAE), WITH THE DESCRIPTION OF FOUR NEW SPECIES, AND ALSO OF THREE NEW SPECIES FROM GERMANY.

By Kenneth A. Spencer.

Introduction.

The genus *Melanagromyza* Hendel in this country has hitherto consisted of 13 species, to which can now be added four new species bred from stems and also three further additions to the British list. These 20 species consist of nine internal stem-feeders, one stem-miner, three leaf-miners, two gall-causers and five whose biology is unknown.

This genus is one of the most homogeneous within the family Agromyzidae with the inevitable result that in several cases groups of species have been lumped together, until recent clarification of the biology made possible correct splitting into individual species.

The adults are almost uniformly black with some slight variation in the metallic sheen of the mesonotum and abdomen, but with little variation in chaetotaxy or wing venation. As might be expected, the closely related species among the stem-feeders are the most difficult to differentiate and the most important characters of taxonomic value have been found to be the following: arrangement of orbital setulae, colour of squamal fringe, degree of projection of frons above eye, and number of lower orbital bristles. Characters such as the size of the vertical triangle, the arrangement of hairs on the eyes and the size of the lunule have proved too variable to be of value. In two cases it has not so far proved possible to differentiate adequately between the adults of closely related species, but differences in the puparia have satisfied the author that separate species are involved.

Hering (1957) has recently published a detailed study of the larvae of a number of these species and his findings largely confirm my observations on the adults and the puparia. The nomenclature in this paper is as used by Hering (1957).

I have recently also discovered three new stem-feeding species of this genus in Germany and for convenience they are described in an Appendix to this paper, and have been included in my new key to the British species.

Description of New Species.

Examination of stems between autumn and early spring quickly reveals whether or not they have been attacked by *Melanagromyza* larvae, and a little practice suffices to locate and extract undamaged the puparia which in these species remain within the stem until the normal emergence time in May or June. Collecting in this way I have discovered two new species and confirmed two more in this country.

Melanagromyza nibletti sp. n.

Some months ago Mr. Niblett kindly presented me with four specimens he had bred from stems of *Silaum silaus* (L.) Schinz and Thell. on Bookham Common, Surrey, some years previously. I originally referred these specimens to the common *M. cirsii* (Rond.). In November, 1956, however, I collected further puparia from Bookham and re-examination of the flies, together with a study of the puparia, has satisfied me that a new species is concerned, which I have pleasure in naming after Mr. Niblett.

Head : frons twice width of eye, projecting substantially above eye in profile ; cheeks visible as distinct ring below eye, slightly wider in centre ; jowls uniformly rounded, deepest in centre, slightly less than one-fourth height of eye ; 2 upper orbital bristles and 3 lower orbitals ; orbital setulae sparse, slender, all proclinate or more frequently in second row reclinate. *Mesonotum :* 2 dorsocentrals, second at level of supra-alar ; acrostichals in 8 rows. *Legs :* mid-tibia with 2 strong bristles. *Wing :* length 2·5 mm. ; second costal segment slightly variable, 4–4·5 times length of fourth.

Colour : head predominantly matt blackish-brown ; orbits with slight shine at base of orbital bristles ; vertical triangle weakly shining ; mesonotum somewhat matt but with distinct bluish-black subshine ; squamae pale yellowish-grey, fringe pure white ; abdomen shining greenish-coppery.

Characteristic features are the fine orbital setulae and the white squamal fringe.

Posterior spiracular processes of puparium separated by own diameter (fig. 1), the processes being highly chitinised, solid black, with a well-defined horn ; 10–12 buds present which are indistinct and difficult to differentiate ; each process forms a high projection from anal segment of puparium.

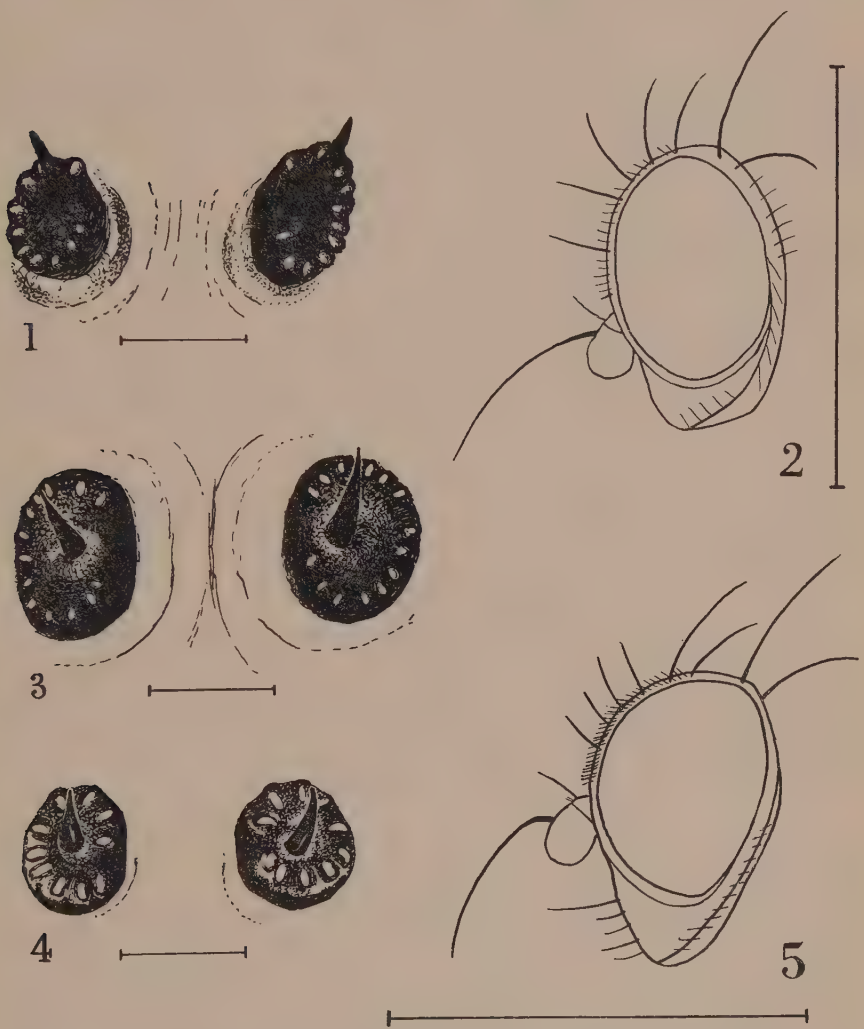
Holotype ♂, 6.vii.1951 ; *paratypes*, 1 ♀, 6.vii.1951, and 1 ♂ and 1 ♀, 8.vii.1951 (*M. Niblett*), and also 1 ♂ and 2 ♀, emerged 3.iv.1957 (*K. A. Spencer*), all Surrey : Bookham, *ex* stems of *Silaum silaus* (L.) Schinz and Thell., in my collection.

Melanagromyza sativae sp. n.

I originally discovered puparia in the stems of *Pastinaca sativa* L. in the Juniper Valley, Box Hill, Surrey, in 1954. However, I have only recently recognised that they represent a new species which I have now found to be abundant with its food-plant in various Surrey localities. Evidence so far available suggests that it is host-specific.

Head (fig. 2) : frons at foremost ocellus twice width of eye, equal to distance from hind-margin of head to base of antennae ; 2 upper orbitals, 3 (4) lower orbitals ; the 2 upper and the upper lower orbitals equidistant ; foremost lower orbital inserted at half height of lunule ; orbital setulae short, slender, irregularly in 2 rows, predominantly upright or slightly proclinate, extending from near base of antennae to upper upper orbital ; lunule large, semi-circular, demarcated from frons by deep furrow ; orbits slightly converging, broadening at lunule, in profile visible as narrow ring above eye ; cheeks forming narrow ring below eye, jowls rounded, deepest in centre, one-fifth to one-sixth height of eye ; face with well-defined median keel, continuing between the antennae, broadening and furrowed as it joins lunule ; in male eyes thickly haired above, in female usually with short, sparse hairs. *Mesonotum :* 2 strong dorsocentrals, second over half length of first and slightly behind supra-alar ; acrostichals irregularly in 10 rows. *Legs :* mid-tibia with 2 postero-dorsal bristles. *Wing :* length 2·7–3·0 mm.

Colour : orbits and vertical triangle somewhat shining black, frons matt brownish-black ; lunule more greyish-black ; cheeks shining-black, contrasting with matt brownish-black jowls ; mesonotum predominantly matt but with distinct coppery metallic subshine ; squamae whitish-grey to greyish-brown, fringe dark-ochreous to greyish-brown but never jet black ; wings clear, hyaline, veins dark brown ; abdomen shining, metallic greenish.



Figs. 1–5.—(1, 3, 4) Posterior spiracular processes of puparium of (1) *M. nibletti* sp. n. (3) *M. sativae* sp. n. (4) *M. torilidis* sp. n. (2, 5) Head of (2) *M. sativae* sp. n. (5) *M. tripolii* sp. n. (Scale line : figures 1, 3 and 4, 0·1 mm. ; figures 2 and 5, 1 mm.)

Characteristic features are the short, fine orbital setulae and the dark but not black squamal fringe.

Posterior spiracular processes of puparium separated by own diameter (fig. 3), highly chitinized, dark-brown ; with 14 small, closely-adjoining buds arranged regularly around the broad-based but rather short spiracular horn ; the processes only slightly raised above anal segment of puparium.

Holotype ♂, SURREY : Betchworth, 30.v.1956 ; *paratypes*, 9 ♂, Betchworth and Bookham, May and June, 1956 ; 8 ♀, Betchworth, May and June, 1956 ; 1♀, Box Hill, June, 1954, all *ex* stems of *Pastinaca sativa* L. (*K. A. Spencer*), in my collection.

Melanagromyza torilidis sp. n.

While examining stems assumed to be *Silaum* at Bookham in January, 1956, puparia were discovered which later examination showed to belong to a different species. Stems were subsequently found in November, 1956 retaining the fruit, and this permitted identification of the plant as *Torilis japonica* (Houtt.) DC.

Morphological characters essentially as in *M. sativae* m. Slightly but significantly smaller—wing length 2·5 mm. ; squamae grey with dark brown margins and brown fringe, as in darkest specimens of *sativae* ; *mesonotum* with blackish subshine, not distinctly coppery, as in *sativae* ; *abdomen* more matt but still with distinct black or coppery sheen ; *eyes* in male with longer but sparser hairs than in *sativae*.

The most distinctive difference is seen in the puparium, which has the posterior spiracular processes separated by their own diameter, each with 10 well-defined buds surrounding the central horn ; the buds consistently larger and more widely-spaced than in *sativae* (fig. 4).

Holotype ♂, 19.v.1956 ; *paratypes* 2 ♂, 17 and 24.v.1956, and 1 ♀, 24.v.1956 ; all SURREY : Bookham, *ex* stems of *Torilis japonica* (Houtt.) DC (*K. A. Spencer*), in my collection.

Melanagromyza tripolii sp. n.

In June, 1954 flies which I initially referred to *M. cirsii* (Rond.) were swept in abundance on *Aster tripolium* L. at Faversham, Kent. Mr. J. E. Collin, with whom I discussed this species, expressed the opinion that the specimens were in fact distinct and kindly allowed me to examine his own specimens taken on saltings at various localities on the East Coast. Further study has now shown both the fly and puparium to be quite distinctive.

Head (fig. 5) : frons at foremost ocellus twice width of eye, 2 upper orbitals directed upwards and outwards, 3 or 4 lower orbitals directed inwards ; orbital setulae numerous, long, in several rows, extending from mid-way between front lower orbital and base of antennae to upper upper orbital, all distinctly proclinate ; orbits broad, slightly converging, not markedly widening at lunule, visible as broad ring above eye in profile ; cheeks forming distinct ring below eye, slightly broader in centre, jowls rounded, deepest in centre, together one-fourth height of eye ; face normal ; eyes in male long haired above, in female the hairs slight and sparse or absent. *Mesonotum :* chaetotaxy normal. *Legs :* mid-tibia with 2 postero-dorsal bristles. *Wing :* length 2·8–3·0 mm., second costal segment 4 times length of fourth.

Colour : frons, jowls and face matt black ; vertical triangle and orbits slightly shining ; mesonotum with characteristic, slight coppery to greenish subshine ; squamae pale, whitish with slightly yellowish margins, fringe silvery-white ; abdomen shining, coppery or green.

Characteristic features are the thick, proclinate orbital setulae, the silvery-white squamal fringe and the metallic subshine of the mesonotum.

Puparium a distinctive orange-brown in colour ; posterior spiracular processes separated by their own diameter, 14 buds present, highly differentiated, three-dimensional and arranged irregularly around the small central horn (fig. 6).

Holotype ♂, 27.vi.1954 ; *paratypes* 7 ♂, 27.vi.1954, 2 ♂, 1.vii.1955, 2 ♀, 27.vi.1954, 1 ♀, 1.vii.1955 ; all KENT : Faversham, swept and bred from *Aster tripolium* L. (*K. A. Spencer*), in my collection.

ADDITIONS TO THE BRITISH LIST.

M. angelicae (Frost).

This species is new to Britain and to the Palaearctic Region. The species occurring commonly on *Angelica* in Europe has hitherto been lumped with *M. lappae* (Lw.), which occurs exclusively on *Arctium* spp. During the past three years I have examined long series of bred specimens from both plants and have found that there is a constant colour difference in the puparia from the two plants : in the species ex *Arctium* the puparium is brownish-yellow, almost olive-coloured, while in the *Angelica* specimens it is a pale whitish-yellow. I also noticed that with specimens collected at the same time and kept at unheated room temperature, those from *Arctium* emerge in the second and third weeks of May, while those from *Angelica* emerge consistently two weeks later at the beginning of June. Despite these clear indications that two species were involved, it has hitherto remained impossible to separate the adults. Examination of the larvae and puparia reveals slight differences which support the view that the specimens from the two plants are distinct species.

My examination of the puparia shows that there are distinct and reasonably constant differences in the number and degree of regularity of the buds on the posterior spiracular processes. In *angelicae* (Frost) these are normally 18 in number, well-defined and arranged in perfect regularity in an ellipse around the spiracular horn (fig. 7). In *lappae* (Lw.) they vary in number between 16 and 21, are slightly larger, less clearly defined and more irregular, several of them projecting outside the ring of the ellipse.

Frost (1934) described *Agromyza angelicae* as a stem-miner on *Angelica atropurpurea* from Ithaca, New York. Mr. Kenneth E. Frick, of the Irrigation Experiment Station, Prosser, Washington, has kindly examined *Melanagromyza* specimens bred from *Angelica sylvestris* L. in Britain and has confirmed that they agree with Frost's type.

M. goniaea Hendel.

I recently discovered four specimens referable to this species in Mr. J. E. Collin's collection taken at Porthcawl in June and July, 1906, and at Snailwell, Cambs., in June, 1908. Hendel's type was taken in Austria and he refers to a second specimen from Finland. Hering, who kindly confirmed my determination of Collin's specimens, has also taken the species sparingly in Germany. Its biology is unknown and it may well be that a species group is concerned.

M. pubescens Hendel.

I have recently examined two specimens of this species, one taken by C. G. Nurse in June, 1921 on Putney Heath, London, and the second by Collin on 9th May, 1939 at Barton Mills, Norfolk. The species is widespread on the continent but local ; its biology is not known.

Food-plants of Stem-mining Species.

Hendel (1936) refers numerous food-plant records rather arbitrarily to the two species *aeneiventris* (Fall.) and *lappae* (Lw.). The species described by Fallén as *aeneiventris* was bred from *Urtica* (and is thus the same as *fuscociliata* Hd.), whereas Hendel used this name to cover the three Compositae feeders, *cirsii* (Rond.), *dettmeri* Hg. and *tripolii* sp. n. The species *lappae* (Lw.) feeds exclusively on *Arctium* spp. In view of our increased knowledge of this group,it can now be seen that Hendel's food-plant records are inaccurate and confusing, and I therefore give below my own records for species I have bred in this country and in Germany (including also one record of Groschke's).

Species.	*Food-plant(s).*
aeneiventris (Fall.) syn. *fuscociliata* Hd.	*Urtica dioica* L.
angelicae (Frost)	*Angelica sylvestris* L., *Heracleum sphondylium* L.
artemisiae sp. n.	*Artemisia vulgaris* L.
cirsii (Rond.)	*Cirsium palustre* (L.) Scop., *C. vulgare* (Savi)Ten., *Senecio jacobaea* L., ? *Inula* sp.
dettmeri Hg.	*Achillea millefolium* L., *Centaurea nigra* L., *Senecio jacobaea* L., *Hieracium sabauda* Pugsl. (Groschke).
eupatorii sp. n.	*Eupatorium cannabinum* L.
lappae (Lw.)	*Arctium lappa* L.
nibletti sp. n	*Silaum silaus* (L.) Schinz and Thell.
sativae sp. n.	*Pastinaca sativa* L.
torilidis sp. n.	*Torilis japonica* (Houtt.) DC.
tripolii sp. n.	*Aster tripolium* L.
verbasci sp. n.	*Verbascum phlomoides* L.

Key to British Species.

Incorporation of new species discovered in this country and in Germany in Hendel's (1936) key has not proved practicable. I have, therefore, prepared a new key, in which however the latter half, from couplet 15, closely follows Hendel. In view of the slight characters differentiating several pairs of species in the imago, I have included confirmatory biological information where necessary.

Key to British Species of *Melanagromyza*.

(including three species from Germany).

1	Orbital setulae all reclinate	15
–	Orbital setulae either proclinate or both proclinate and reclinate	2
2	Squamae distinctly grey, fringe black or brown to grey	3
–	Squamae pale, whitish, fringe white or pale ochreous	8
3	Squamal fringe brown to grey	4
–	Squamal fringe black	5

4 Mesonotum with blackish subshine; small species—wing 2·5 mm. Food-plant *Torilis japonica* (Houtt.) DC. . . . . **torilidis** sp. n.
– Mesonotum with distinct coppery subshine, larger species: wing 2·7–3·0 mm. Food-plant *Pastinaca sativa* L. . . . . **sativae** sp. n.
5 Orbital setulae proclinate 6
– Orbital setulae both proclinate and reclinate 7
6 Mesonotum with distinct blackish subshine; posterior spiracular processes of puparium black, highly chitinised, horn large. Food-plant *Urtica dioica* L. . . . . **aeneiventris** (Fallén)
– Mesonotum matt blackish-grey; posterior spiracular processes of puparium pale, slightly chitinised, horn minute. Food-plant *Eupatorium cannabinum* L. . . . . **eupatorii** sp. n.
7 Orbital setulae long, predominantly proclinate, except few at front **cunctata** Hendel
– Orbital setulae short, predominantly reclinate, except few at rear **beckeri** Hendel
8 Frons not or only slightly projecting above eye . . . . **dettmeri** Hering
– Frons strongly projecting 9
9 Two lower orbital bristles . . . . . **cirsii** Rondani
— Three to five lower orbitals 10
10 Orbital setulae proclinate, thick 11
— Orbital setulae distinctly in 2 rows, both proclinate and reclinate . 12
11 Squamal fringe silvery-white . . . . . **tripolii** sp. n.
— Squamal fringe darker, ochreous . . . . . **artemisiae** sp. n.
12 Squamal fringe fine, silvery-white, posterior spiracular processes separated by own diameter . . . . . **nibletti** sp. n.
— Squamal fringe coarser, darker, posterior spiracular processes adjoining 13
13 Posterior spiracular processes pale, weakly chitinised, buds very irregular. Food-plant *Verbascum phlomoides* L. . . . . **verbasci** sp. n.
— Posterior spiracular processes black, strongly chitinised, buds more regular 14
14 Posterior spiracular processes with buds entirely regular, 18–20. Food-plant *Angelica* spp. . . . . **angelicae** (Frost)
— Buds less regular, 16–21. Food-plant *Arctium lappa* L. . **lappae** (Loew)
15 Squamal fringe pale, whitish 16
— Squamal fringe dark, brown to black 17
16 Jowls elongated, deepest at rear, orbital setulae long . **albocilia** Hendel
— Jowls narrow, deepest in front, orbital setulae short, sparse **cunctans** Meigen
17 Frons and cheeks not projecting above eye in profile . . **pulicaria** Meigen
— Frons and cheeks projecting 18
18 Second dorso-central at level of supra-alar 19
— Second dorso-central behind supra-alar 22
19 Costa ending at vein r_5 . . . . . **simplex** (Loew)
— Costa extending to vein m_{1+2} 20
20 Jowls elongated at rear, front margin of jowls straight . **pubescens** Hendel
— Jowls not elongated, rounded 21
21 Frons only slightly projecting above eye in profile; orbital setulae long, conspicuous . . . . . **goniaea** Hendel
— Frons more strongly projecting; orbital setulae shorter **nostradamus** Hering
22 Costa ending at vein r_5 . . . . . **simplicoides** Hendel
— Costa extending to vein m_{1+2} . . . . . **schineri** (Gir.)

Key to Posterior Spiracular Processes of Puparia

The following key permits identification of the 12 stem-boring and one stem-mining species included above from the puparia :

1	Posterior spiracular processes without horn	**simplex** (Loew)
–	Processes with horn	2
2	Posterior spiracular processes adjoining	3
–	Processes separated by approximately own diameter	6
3	Entire process black, solidly chitinised	4
–	Horn black, remainder of process lighter brown	5
4	Posterior spiracular processes each with 18–20 buds arranged entirely regularly	**angelicae** (Frost)
–	Processes with 16–21 buds, less regular	**lappae** (Loew)
5	Horn and central area of processes black, surrounding area lighter brown, buds regular	**dettmeri** Hering
–	Whole process weakly chitinised, arrangement of buds very irregular	**verbasci** sp. n.
6	Puparium orange-brown	7
–	Puparium pale, whitish-yellow	8
7	Buds clearly differentiated, three-dimensional, processes raised above anal segment of puparium	**tripolii** sp. n.
–	Buds ill-defined, processes flat	**artemisiae** sp. n.
8	Horn slender, minute	**eupatorii** sp. n.
–	Horn larger, normal	9
9	Entire process black or dark brown, strongly chitinised	10
–	Buds pale brown, 16–18, central area filled by base of black horn	**cirsii** (Rondani)
10	Processes forming greatly elongated ellipse	**aeneiventris** (Fallén)
—	Processes more round	11
11	Processes each with 14 buds	**sativae** sp. n.
—	Processes each with 10 buds	12
12	Processes jet black	**nibletti** sp. n.
—	Processes at most dark brown	**torilidis** sp. n.

Appendix.

Three new stem-mining *Melanagromyza* species from Germany.

Melanagromyza artemisiae sp. n.

Puparia were obtained from stems of *Artemisia vulgaris* L. near Pfungstadt, Hessen, Germany, in November, 1956, from which seven flies emerged in March, 1957. The species is new to science.

Head : orbits well-defined and distinctly projecting above eye in profile ; 2 upper orbitals directed upwards (the lower somewhat inwards), 4 lower orbitals directed inwards ; orbital setulae numerous, in 2 rows, the inner row directed inwards, the outer row outwards but all hairs predominantly proclinate ; jowls rounded, one-sixth height of eye, deepest in centre ; antennae separated by narrow facial keel, third segment rounded. *Mesonotum :* chaetotaxy normal. *Wing :* length 3·4 mm.

Colour : frons matt black, orbits and ocellar triangle weakly shining ; jowls matt brownish-black, face more shining ; mesonotum matt black with distinct metallic subshine ; squamae greyish-white, with orange-brown margin and ochreous fringe ; legs entirely shining black ; abdomen shining, coppery.

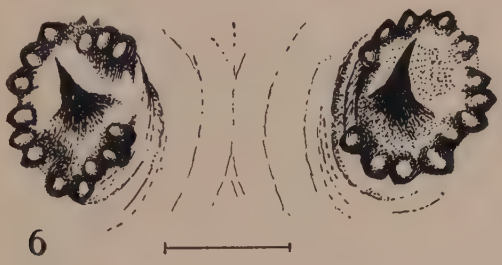
Closely resembles *M. tripolii* sp. n. but immediately distinguished from it by its darker squamal fringe.

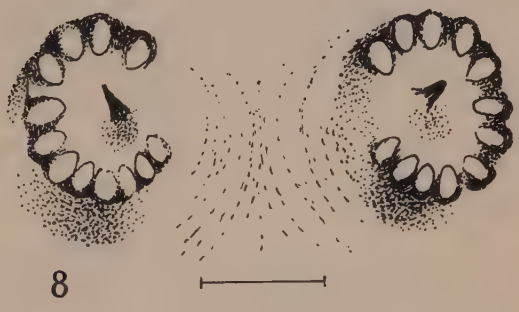
Puparium pale orange-brown; posterior spiracular processes separated by their own diameter, black, solidly chitinised, with a short but strong horn and 12 ill-defined buds; puparium readily distinguishable from any of the known species in the genus.

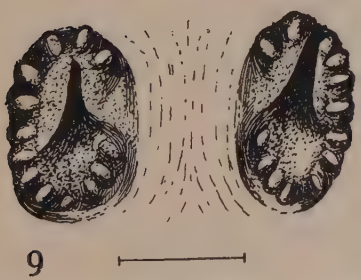
Holotype ♀, emerged 6.iii.1957; *paratypes*, 4 ♂, 2 ♀, March, 1957; all GERMANY: Pfungstadt, Hessen, *ex* stem *Artemisia vulgaris* L. (*K. A. Spencer*), in my collection.

Melanagromyza eupatorii sp. n.

Puparia were obtained in April and November, 1956, from stems of *Eupatorium cannabinum* L. growing in the wooded hills north of the River Neckar at Heidelberg. Examination of the two flies which emerged has shown the species to be new to science.







FIGS. 6–10.—Posterior spiracular processes of puparium of (6) *M. tripolii* sp. n. (7) *M. angelicae* (Frost). (8) *M. eupatorii* sp. n. (9) *M. aeneiventris* (Fall.). (10) *M. verbasci* sp. n. (Scale line: 0·1 mm.)

External characters essentially as in *M. aeneiventris* (Fall.). *Head :* frons projecting above eye in profile, 2 upper orbital bristles, 4 lower orbitals directed inwards ; orbital setulae numerous, all proclinate. *Mesonotum :* largely matt, greyish-black, less shining than in *aeneiventris*. Squamal fringe black. *Wing :* length 2·5–2·7 mm.

Puparium the usual pale whitish-yellow but posterior spiracular processes distinct from those of any other species in the genus (fig. 8), being circular, each with 10–12 buds encircling the minute, slender horn ; processes very lightly chitinised and only the very centre of the ellipse of buds is taken up by the base of the horn, while in *aeneiventris* the broad black base of the horn entirely fills the width of each process, which is characteristically elongated (fig. 9).

Holotype ♂, 2.v.1956 ; *paratype* 1 ♂, 10.ii.1957, both GERMANY : Heidelberg, *ex* stem *Eupatorium cannabinum* L. (*K. A. Spencer*), in my collection.

Melanagromyza verbasci sp. n.

Puparia were obtained in April and in November, 1956 from stems of *Verbascum phlomoides* L. growing beside the autobahn near Pfungstadt, Hessen. Nine flies emerged and the species is new to science.

Head : frons twice width of eye ; orbits and cheeks visible as narrow ring above and below eye in profile ; orbits broad, widening at lunule ; ocellar triangle large, extending to centre of lower orbitals ; 2 upper orbitals directed backwards, 4 lower orbitals directed inwards, orbital setulae relatively long, fine, sparse, in 2 rows, the inner predominantly proclinate, the outer predominantly reclinate ; eye substantially longer than broad, in ratio 30 : 18 ; jowls uniformly rounded, one-sixth height of eye. *Wing :* length 3·5 mm. Resembling *M. lappae* (Lw.) and *angelicae* (Frost) in other details of morphology.

Posterior spiracular processes (fig. 10) adjoining, light brown, weakly chitinised apart from strong black horn, with 12–14 buds arranged with characteristic irregularity, which immediately distinguishes the species from *M. lappae* and *angelicae*.

Holotype ♀, 3.iv.1957 ; *paratypes* 4 ♂ and 4 ♀, spring 1956 and 1957 ; all GERMANY : Pfungstadt, Hessen, *ex* stems *Verbascum phlomoides* L. (*K. A. Spencer*), in my collection.

ACKNOWLEDGMENTS.

I wish to record my gratitude in particular to Prof. E. M. Hering, with whom I have had many discussions in Berlin and exchanged many letters concerning problems covered in this paper and whose guidance during the past five years has alone made this and other papers possible. I am also indebted to Mr. J. E. Collin for sending me his material for examination, to Mr. M. Niblett for the presentation of specimens, to Mr. H. Oldroyd for kindly reading the manuscript, and to my wife for the preparation of the drawings of the puparia.

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SIPHONAPTERA FROM THE ISLES OF AMSTERDAM AND KERGUELEN, COLLECTED BY PATRICE PAULIAN, AND FROM ANTIPODES ISLAND.

By F. G. A. M. Smit.

(*British Museum (Natural History); The Zoological Museum, Tring, Herts.*).

In 1952 Dr. Patrice Paulian submitted to Dr. Karl Jordan for identification a number of fleas collected by him during 1951 on the desolate and windswept Kerguelen Isles and a few others which he obtained during a short visit to Amsterdam Island (also called New Amsterdam Island; 37° 40′ S., 77° 34′ E.).

Hitherto only a few specimens of fleas had been collected on the Kerguelen Isles, but Dr. Paulian succeeded in bringing together a total of 187 fleas, namely 2 from the introduced European rabbit, 15 from the introduced house-mouse (apart from introduced dogs these are the only mammals occurring in Kerguelen) and 170 from 9 of the 21 birds known to breed on these islands.

The names of the bird-fleas have been published by Paulian (1953*a*) but without any further particulars. In the present paper full data of the various species are given. It was especially gratifying to see among Dr. Paulian's material a fine series of the Pygiopsyllid bird-flea *Notiopsylla kerguelensis*, which enabled me to establish that the *Notiopsylla* from the Antipodes Island parrakeet is a different species, a description of which is included in this paper.

For an interesting general account of animal life on the Kerguelen Islands *see* Paulian, 1953*b*.

Amsterdam Island.

Parapsyllus longicornis longicornis (Enderlein), 1901.

From nests of *Eudyptes cristatus*, xi.1951, 4 ♀ (*P. Paulian*).

This flea was hitherto known only from St. Paul Island (about 100 miles south of Amsterdam Island), where it has been collected and recorded from the following hosts: *Eudyptes chrysocome* (Vieillot) (= *E. cristatus* (Miller)), *Eudyptes chrysolophus* (Brandt), *Eudyptula* sp. and *Pygoscelis* sp. All these birds are penguins, the primary hosts of *Parapsyllus* spp. One may also expect to find *P. l. longicornis* in nests and burrows of other birds since *P. magellanicus heardi*, for example, although most numerous in nests of penguins, is now known from the nests of nine other sea-birds.

Kerguelen Isles.

Parapsyllus magellanicus heardi de Meillon, 1952.

Port-aux-Français: from burrow of *Halobaena caerulea*, 16.iv.1951, 2 ♀, and 8.v.1951, 1 ♂, 1 ♀; from burrow of *Oryctolagus cuniculus* (accidental host), 31.v.1951, 2 ♀; from nest of *Phalacrocorax verrucosus*, 17.vi.1951, 2 ♂; from burrow of *Pterodroma macroptera macroptera*, 4.xi.1951, 6 ♂, 6 ♀;

from nest of *Macronectes giganteus*, 6.xi.1951, 10 ♂, 13 ♀; from nest of *Catharacta skua lönnbergi*, 19.xi.1951, 6 ♂, 4 ♀.

Pointe Guite, Prince de Galles Peninsula: from nest of *Macronectes giganteus*, 17.ix.1951, 1 ♀.

Prince de Galles Peninsula: from nest of *Phoebetria palpebrata*, 29.xi.1951, 6 ♂, 9 ♀; from nest of *Eudyptes cristatus*, 29.xi.1951, 31 ♂, 48 ♀. (All collected by *P. Paulian*.).

This subspecies was previously only known from (*a*) Heard Island from nests of *Phoebetria palpebrata*, *Macronectes giganteus*, *Catharacta skua lönnbergi*, *Daption capensis*, and from burrows of *Pachyptila* (= *Attaprion*) *desolata*, and (*b*) from the very distant Macquarie Island, host unknown (de Meillon, 1952 : 5–8). In the table, on p. 7 of his paper, de Meillon (*l.c.*) also gives as host *Diomedea* (= *Thalassarche*) *melanophris*.

Nosopsyllus fasciatus (Bosc), 1800. (Figs. 1–7).

Port-aux-Français: from nest of *Mus musculus*, 31.x.1951, 1 ♂, 10 ♀, and 8.xi.1951, 1 ♂, 3 ♀ (*P. Paulian*).

The two males differ from all other specimens of this common cosmopolitan rat-flea which I have seen by the very low fixed process of the clasper and the manubrium bent somewhat downwards (figs. 1, 2); in all other specimens examined the fixed process projects considerably (figs. 3–7) and the manubrium is usually straight. More specimens collected from the Kerguelen house-mouse are needed before we can confirm that the differences between the very isolated Kerguelen population of *N. fasciatus* and those from other parts of the world are constant. If so, then the Kerguelen *N. fasciatus* should be recognised as a separate subspecies. I did not observe any differences between the females. It is worth noting that *Mus musculus* has apparently increased in size on Kerguelen and is considered to form a special ecological race, though not subspecifically distinct from typical *Mus musculus*. " . . . il s'agit de souris souvent baptisées rats, . . . Ce sont de grosses souris qui se sont énormément développées et envahissent les campements; la base de Port-aux-Français en est littéralement infestée; elles pénètrent partout, rongent tout ce qu'elles trouvent et salissent tout." (Paulian, 1953*b*).

Notiopsylla kerguelensis (Taschenberg), 1880. (Figs. 9, 11, 12, 14, 15).

Port-aux-Français: from burrow of *Halobaena caerulea*, 16.iv.1951, 11 ♂, 7 ♀ and 8.v.1951, 3 ♂, 1 ♀; from *Pelecanoides urinatrix exsul*, 27.x.1951, 1 ♀.

Hoskyn Island: from burrow of *Adamastor cinereus*, 21.v.1951, 1 ♂. (All collected by *P. Paulian*).

The following records of this flea of petrels and gulls have been published:

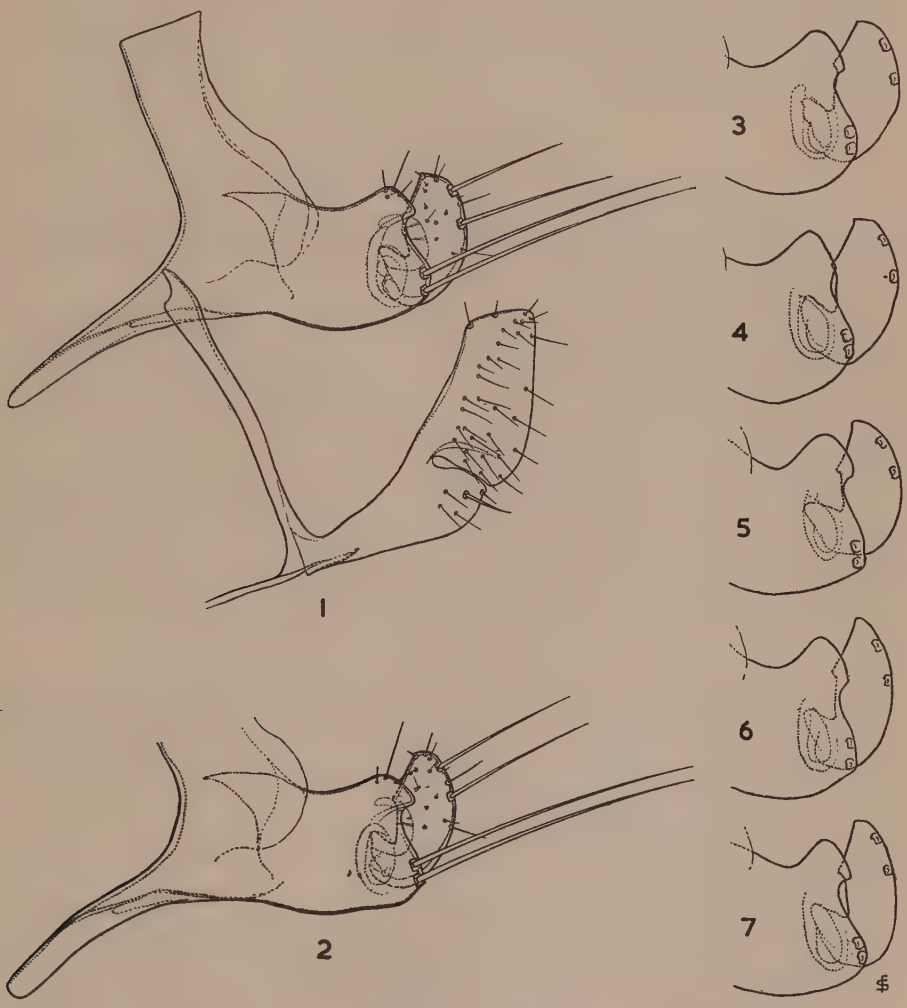
Kerguelen: from *Pelecanoides urinatrix* (Taschenberg, 1880*a*: 67, 68, 122; 1880*b*: 169; Jordan and Rothschild, 1908: 93; Fuller, 1943: 165). Fuller (1943 : 167) also listed *Phoebetria palpebrata* (syn.: *Diomedea fuliginosa*) as host, but from the facts given by him this record must be based on the statement by Eaton (1875*a*, 1875*b*) that " A *Pulex* is parasitic upon *Halidroma*, and one (possibly the same species) on *Diomedea fuliginosa*." However, it cannot be established whether this " *Pulex* " of the latter host was a *Notiopsylla*

or a *Parapsyllus*. The fleas collected by Dr. Paulian from the nest of *Phoebetria palpebrata* on Kerguelen are all *Parapsyllus magellanicus heardi*. *Halidroma* is a misprint for *Haladroma*, which is a synonym of *Pelecanoides*.

Heard Island : from *Macronectes giganteus* (de Meillon, 1952 : 7).

South Georgia : from *Prion banksi* (= *Attaprion* (syn. : *Pachyptila*) *desolatus*) and *Larus dominicanus* (Jordan and Rothschild, 1914 : 220 ; Murphy, 1936 : 628).

The *Notiopsylla* recorded from Antipodes Island under the name *kerguelensis* does not belong to that species and is described below.



Figs. 1–7.—*Nosopsyllus fasciatus* (Bosc). 1. Clasper and sternum IX (Kerguelen) ; 2. Clasper (Kerguelen) ; 3–7. Outline of processes of clasper of specimens from (3) Tarascon/Ariège, France ; (4) Quebec, Canada ; (5) Osea Island, England ; (6) Pavilly, France ; (7) Krummnussbaum, Austria.

The three islands from which *N. kerguelensis* is known are all situated in the antarctic zone. Kerguelen and Heard Islands are not a great distance apart, but South Georgia is a very long way from these two islands. The occurrence of this flea on such distant islands can be accounted for by the wide distribution of several of the hosts (petrels and gulls). De Meillon (1952 : 9) remarked that this species of flea " appears to be freely carried about by flying birds and hence has not shown a tendency towards subspecific differentiation ". The new species described below is obviously a parasite of a ground-dwelling bird whose distribution is restricted to one island, and this supports the assumption that *N. kerguelensis*, a parasite of great travellers, is not likely to split up into different forms on different islands as long as it remains faithful to petrels and gulls.

Fuller (1943) published an interesting " Historical note on *Notiopsylla kerguelensis*, an antarctic flea ".

Antipodes Island.

Notiopsylla enciari sp. n. (Figs. 8, 10, 13, 16).

Pulex kerguelensis Taschb. Rothschild, 1895, *Novit. zool.* **2** : 66 (*nec* Taschenberg, 1880).
Goniopsyllus kerguelensis Tasch. (1880). Jordan and Rothschild, 1908, *Parasitology* **1** : 93 (part : ♂ from Antipodes Island).

Type material, Holotype male, Antipodes Island : from *Cyanoramphus unicolor* (*M. Dannefaerd*) (since Rothschild recorded this specimen in 1895, it must have been collected prior to that year) ; allotype female, Antipodes Island : off *Cyanoramphus unicolor*, 9.xi.1950 (*E. G. Turbott*). Holotype in the Rothschild collection of fleas at Tring ; allotype in the collections of the Auckland Institute and Museum, New Zealand.

Diagnosis.—The new species differs in both sexes from the only other known member of the genus, *N. kerguelensis* (Taschenberg), by the frons being rounded instead of distinctly angular, and by the reduction in size and number of the marginal tergal spinelets ; the male is distinguishable from that of *N. kerguelensis* by details of the aedeagus and the female by the outline of the posterior margin of sternum VII and the shape of the spermatheca.

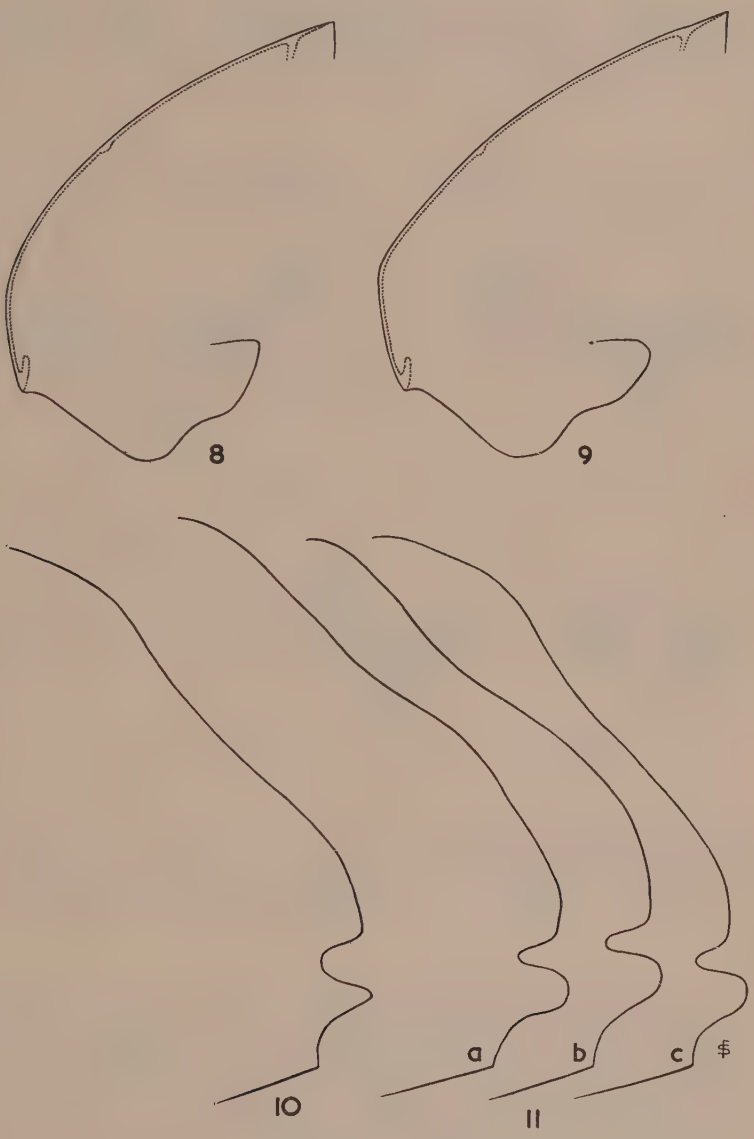
Description.—Frontal margin smoothly rounded (fig. 8), not markedly angular as in *N. kerguelensis* (fig. 9). Terga II–V with the following numbers of very small spinelets, ♂ : 1/2, 1/1, 1/1, 1/1 ; ♀ : 1/1, 1/1, 1/1, 1/0 respectively. In *N. kerguelensis* tergum VI bears one spinelet each side in all specimens studied, and the numbers on terga II–VI are, ♂ : 2–3, 1–2, 1, 1, 1 ; ♀ : 2 (rarely 3), 1–3, 1, 1, 1 respectively ; these spinelets are about twice as large as those of *N. enciari*.

In other respects the head, thorax, legs and unmodified abdominal segments resemble those of *N. kerguelensis*.

Male.—Posterior margin of sternum VIII evenly rounded throughout, but in *N. kerguelensis* the lower part of this margin is slightly concave. Clasper virtually the same as that of *N. kerguelensis*. Dorso-apical margin of distal arm of sternum IX almost straight, whereas in *N. kerguelensis* this margin is strongly concave and the arm relatively shorter. Differences in the structure of the aedeagus of the two species of *Notiopsylla* are illustrated in figures 12 and 13 (note the straight apical margin of the dorsolateral wall and especially the much longer and more slender inner tube in the new species (fig. 13)).

Female.—Lobe below lateral sinus in posterior margin of sternum VII (fig. 10) pointed and much narrower than that of *N. kerguelensis* (fig. 11*a–c*), while the lateral sinus is much

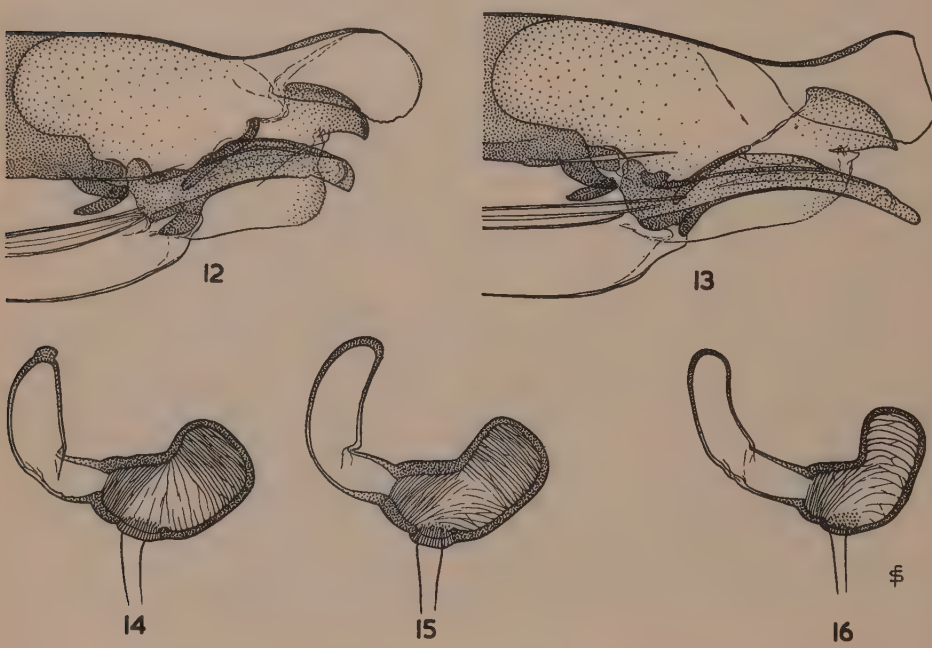
wider in the new species. Spermatheca (fig. 16) with a long and narrow hilla and the striation in upper part of bulga rather coarse. In *N. kerguelensis* the spermatheca is rather variable (figs. 14, 15) and, *e.g.*, a papilla at the apex of the hilla may be present (fig. 14) or absent (fig. 15); hilla on the whole shorter and broader in this species, and the bulga broader and more finely striated than in *N. enciari*.



Figs. 8, 9.—Outline of head of female of (8) *Notiopsylla enciari* sp. n. (allotype); (9) *Notiopsylla kerguelensis* (Tasch.) (Kerguelen). Figs. 10, 11.—Outline of sternum VII of female of (10) *Notiopsylla enciari* sp. n. (allotype); (11) *Notiopsylla kerguelensis* (Tasch.) (Kerguelen).

Remarks.—Notiopsylla enciari is the only species of flea so far known from the subantarctic Antipodes Island and the holotype is the first flea mentioned (as "*Pulex kerguelensis*") by Charles Rothschild in his first paper on these insects.

Both known specimens were collected from the now rather rare parrakeet *Cyanoramphus unicolor*, the one before 1895 and the other in 1950. This particular parrakeet is a ground bird which walks and climbs but seldom takes wing; it breeds in holes in the thick matted bases of grass tussocks. The



FIGS. 12, 13.—Aedeagus of (12) *Notiopsylla kerguelensis* (Tasch.) (Kerguelen); (13) *Notiopsylla enciari* sp. n. (holotype). FIGS. 14–16.—Spermatheca of (14, 15) *Notiopsylla kerguelensis* (Tasch.) (Kerguelen); (16) *Notiopsylla enciari* sp. n. (allotype).

association of the new species described above with this parakeet may reasonably be assumed to be genuine, although it must be noted that apparently no collections of fleas from other potential hosts have ever been made on the Antipodes Islands. It would be of interest to know whether *N. kerguelensis* also occurs in the Antipodes or whether it is restricted to the antarctic zone. It seems not unlikely that some petrels or gulls arriving in the Antipodes from antarctic islands must be carrying *N. kerguelensis*, and if these birds should then breed on Antipodes, this species would possibly become established there, but the marked differentiation of *N. enciari* from *N. kerguelensis* speaks for a prolonged isolation of the former from the latter.

Host-flea List.

Kerguelen Isles.

Mammals :

Mus musculus L.—House-mouse
Nosopsyllus fasciatus.
Oryctolagus cuniculus (L.).—European rabbit
Parapsyllus magellanicus heardi (accidental occurrence).

Birds :

Sphenisciformes.

Eudyptes cristatus (Miller)—Rock-hopper Penguin
Parapsyllus magellanicus heardi.

Procellariiformes.

Phoebetria palpebrata (Forster)—Light-mantled Sooty Albatross
Parapsyllus magellanicus heardi.
Macronectes giganteus (Gmelin)—Giant Petrel
Parapsyllus magellanicus heardi.
Adamastor cinereus (Gmelin)—Grey Petrel
Notiopsylla kerguelensis.
Pterodroma macroptera macroptera (Smith)—Long-winged Petrel
Parapsyllus magellanicus heardi.
Halobaena caerulea (Gmelin)—Blue Petrel
Notiopsylla kerguelensis
Parapsyllus magellanicus heardi.
Pelecanoides urinatrix exsul (Salvin)—Kerguelen Diving Petrel.
Notiopsylla kerguelensis.

Pelecaniformes.

Phalacrocorax verrucosus Cabanis—Kerguelen Cormorant
Parapsyllus magellanicus heardi.

Stercorariidae.

Catharacta skua lönnbergi (Mathews)—Southern Skua
Parapsyllus magellanicus heardi.

Amsterdam Island.

Sphenisciformes.

Eudyptes cristatus (Miller)—Rock-hopper Penguin
Parapsyllus longicornis longicornis.

Antipodes Island.

Psittacidae.

Cyanoramphus unicolor (Lear)—Antipodes Island Parrakeet
Notiopsylla enciari.

Acknowledgments.

I wish to express my most sincere thanks to Dr. Patrice Paulian for having made such a splendid collection of fleas under circumstances which were no doubt not very easy, and for generously presenting the greater part of his material to the British Museum collection of fleas at Tring. I am also much indebted to Dr. E. G. Turbott of the Auckland Institute and Museum for the loan of the allotype of *Notiopsylla enciari*.

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SCIAPUS OLDROYDI SP. N., A NEW SPECIES OF DOLICHOPODIDAE (DIPTERA) FROM DACCA (EAST PAKISTAN).

By S. R. Haider.

(*Malaria Institute of Pakistan, Dacca*).

[Communicated by H. Oldroyd].

The species of *Sciapus* that might occur in Pakistan are very poorly known, and were nearly all described in the last century. The present species seems to be distinct from any of them in the combination of yellowish antennae, yellowish legs and unpatterned abdomen. It seems nearest to *nitens* Fabricius (1805), described as "Habitat in India orientali" but that species has the

Fig. 1.—*Sciapus oldroydi* sp. n., female.

femora black, at least in some specimens, and since the locality is so uncertain it is better to give the present species a new name.

Sciapus oldroydi sp. n.

A minute bluish-green fly, with strong and distinct dark bristles or hairs on the body.

Female.—Head : transverse, ocellar tubercle prominent, with a pair of bristles arising very close together ; front deeply excavated with a pair of strong bristles on either side near the eye margin ; eyes prominent and well separated, bulging out from the sides, broader than the thorax ; antennae small, yellowish-brown, three-segmented, the first segment short, distinguishable from the side, the second a little larger, cup shaped with spines at the tip, the third small, rounded, darker in colour and with a microscopically pubescent arista ; face quite broad, bare and with ashy-grey tomentum. *Thorax :* moderately arched, uniformly bluish-green in colour with quite well developed chaetotaxy ; acrostichals monoserial, dorsocentrals strong, with hairs on post humeral, interalar, notopleural and supra-alar regions ; mesonotum flattened before scutellum, which is bare with two long subapical bristles. *Abdomen :* oval, narrower than thorax, rather exceptionally covered with hairs or bristles, especially at the side, on all segments ; five obvious pregenital segments in female, with short ovipositor. *Legs :* long and slender, yellowish ; femora swollen basally, covered with small bristles ; pulvilli well developed ; all tibiae with small but strong bristles or spines ; tarsi with conspicuous spines or bristles. *Wings :* comparatively long, venation as in figure 1 ; grey with bluish tinge ; halteres well developed and yellowish in colour.

Length : About 2·5 mm.

Male.—Not known.

Pakistan : Dacca, at light, 11.v.1956 (*M. O. Farooque*, Laboratory Assistant). The type female is being deposited in British Museum (Natural History).

I have pleasure in dedicating this species to Mr. H. Oldroyd, to whom I am greatly indebted for confirming the identification and for valuable suggestions and criticism.

Acknowledgment.

I take this opportunity to thank Col. M. Jafar, Director General of Health, Pakistan, for permission to publish this paper.

THE IDENTITY OF *PTINUS LATRO* AUCT. (COLEOPTERA : PTINIDAE).

By B. P. Moore.

(*Pest Infestation Laboratory, London Road, Slough, Bucks.*).

Introduction.

Fabricius (1775) first described a *Ptinus latro* by comparison with *P. fur* (Linnaeus, 1758), of which he thought it might have been an immaculate variety. Subsequently, Illiger (1802) stated that *P. latro* F. was, in fact, the male of *P. fur* (L.). Other authors were content to place the Fabrician insect as a variety of *fur* (L.) without reference to sex, until Boieldieu (1856) published his revision of the Ptinidae. This latter author treated *latro* F. as a separate, sexually dimorphic species, allied to *fur* (L.), but with less prominent pronotal vestiture and immaculate elytra. Although, curiously, Boieldieu did not compare *latro* F. with *P. testaceus* Olivier (1790) (*nom. praeoc.* = *hirtellus* Sturm (1837)), it is clear from his descriptions that he regarded these two species as being closely allied. Unfortunately, he made no mention of the original Fabrician specimens of *latro*, which he presumably did not examine, and the reasons for his decision concerning their identity remain obscure. Nevertheless, his interpretations of *latro* F. and *testaceus* Ol. have been accepted by authors generally, up to and including Hinton (1941), who pointed out that, whereas the females were abundantly distinct, the males were scarcely separable on external characters and apparently had identical genitalia!

Quite recently, Moore, Woodroffe and Sanderson (1956) have shown by means of culture experiments that *P. latro* Boield. et auct. post. is a parthenogenetic form, comprising triploid females only, which reproduce by gynogenesis, after mating with males of *P. hirtellus* Sturm or, to a much lesser extent, with males of other diploid species. (For details of the cytology and biology of this form *see* Sanderson, *Proc.* Xth *Int. Cong. Ent.* (in press) and Woodroffe, *Proc. R. ent. Soc. Lond.* (A) **33** (in press), respectively). This discovery has naturally led to a reconsideration of the nomenclature of the forms involved.

The Identity of *Ptinus latro* Fabricius (1775).

The original diagnosis of this species (Fabricius, 1775 : 63) ran as follows :

"P. thorace bidentato, testaceus, immaculatus. Habitat Strasburgi Dom Prof. Hermann. Statura et magnitudo omino P. furis, cujus forte varietas. Antennae filiformes longtitudine corporis. Thorax angustatus, rotundatus dentibus duobus dorsalis, acutis. Elytra punctato-striata testacea, immaculata."

This description was repeated, in a more or less abridged form, in Fabricius's later works but, unfortunately, no mention was made of the general facies of the type specimen(s)—a character which would have established the sex beyond question. (Males of *P. fur* (L.) and allied species are elongate and fully winged, whereas females are obovate and apterous). Nevertheless, it is possible to infer from the characters given (particularly the length of the antennae) that Fabricius had the male sex before him. This inference is supported by the fact that he later (1801 : 326) quoted Illiger's opinion that *latro* F. was the male of *fur* (L.).

Through the courtesy of Dr. S. L. Tuxen, I have been able to examine the *Ptinus* material contained in the Fabrician collection, which is at present being catalogued and rehoused by Mrs. Ella Zimsen at Copenhagen. This material includes but a single specimen standing over the name *latro*, a male *P. fur* (L.) without data, which, however, cannot be regarded as the type of *P. latro* F., since the elytra are prominently bifasciate, in disagreement with the original description. Moreover, there is no immaculate specimen elsewhere in the collection with which the present specimen could have become interchanged. Since Mons. F. Gouin, of the Musée Zoologique, Strasbourg, has kindly confirmed that the original Johann Hermann collection no longer survives, all type material of *P. latro* F. must be presumed lost.

The foregoing investigation shows that it is now impossible to determine which of the opposing interpretations of the Fabrician *P. latro* presented by subsequent authors is correct. I therefore propose that the opinion of the first reviser, Illiger (*op. cit.* : 387), that *latro* F. = *fur* (L.) be accepted.

The Identity of *Ptinus clavipes* Panzer (1792).

Ptinus clavipes Panzer (1792) has been placed by Pic (1912) as a synonym of *P. latro* F. (*sensu* Boieldieu). However, it is evident from the original description and excellent coloured figure that Panzer's species was based upon a male of the species generally known as *P. hirtellus* Sturm (1837). Since Panzer's name is not invalidated by any homonymy, so far as I am aware, it would appear to be the correct name for Sturm's species.

The Status of *Ptinus latro* auct.

Moore *et al.* (*op. cit.*) suggested that *P. latro* auct. is best regarded as a parthenogenetic, triploid form of *P. hirtellus* Sturm (= *P. clavipes* Panz.). This view is supported by the results of later work and is discussed and upheld by Woodroffe (*in press*). The alternative view that *P. latro* auct. be regarded as a separate species, as have certain parthenogenetic Curculionids (*see* Suomalainen, 1950), seems scarcely to accord with the gynogenetic mode of reproduction. Indeed, the existence of gynogenesis suggests that parthenogenesis in this beetle is of recent origin and, therefore, one cannot ignore the possibility that artificial means may ultimately be discovered for inducing the production of the triploid form from diploid stock, as has been achieved recently with a species of fresh-water fish (Swarup, 1956).

Whatever its ultimate status may be, *P. latro* auct. would appear to be sufficiently distinct, morphologically (*see* Plate I), to be worthy of a name and,

none being available, I propose *mobilis* **nom. nov.** for the purpose. The full synonymy established in this paper thus becomes :—

Ptinus fur (Linnaeus, 1758)

P. latro Fabricius, 1775 **syn. nov.**

Ptinus clavipes Panzer, 1792

P. testaceus Olivier, 1790 *nec* Thunberg, 1784
P. brunneus Duftschmid, 1825 *nec* Gmelin *in* Linnaeus, 1789
P. hirtellus Sturm, 1837 **syn. nov.**
female form **mobilis nom. nov.**
latro Boieldieu, 1856 et auct. (*partim.*) *nec* Fabricius 1775.

Summary.

(1) Previous work has demonstrated *Ptinus latro* auct. to be a parthenogenetic insect, comprising triploid females only.

(2) Evidence is presented to show that *Ptinus latro* Fabricius (1775) should be placed as a synonym of *P. fur* (Linnaeus, 1758).

(3) *Ptinus clavipes* Panzer (1792) is shown to be the correct name for *P. hirtellus* Sturm (1837).

(4) The name *mobilis* **nom. nov.** is proposed for *Ptinus latro* auct. (*nec* Fabricius), which is regarded as the triploid form of female *P. clavipes* Panzer, and the full synonymy is given.

Acknowledgments.

My thanks are due to Drs. S. L. Tuxen and S. G. Larsson and Mrs. Ella Zimsen, of the Universitetets Zoologiske Museum, for their co-operation and hospitality during my visit to Copenhagen ; to Mons. F. Gouin (Strasbourg) for information concerning the Hermann collection ; to Mr. J. H. Hammond (Pest Infestation Laboratory) for the photograph reproduced as Plate I ; and to the authorities of the British Museum (Natural History) for facilities for study.

This paper is published with the consent of the Department of Scientific and Industrial Research.

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PLATE I.

Ptinus clavipes Panzer (*hirtellus* Sturm).

A. Female, *forma mobilis* **nom. nov.** (*latro* auct. *nec* F.) (triploid).

B. Male, *forma typica* (diploid).

C. Female, *forma typica* (diploid).

Ptinus clavipes Panzer (*hirtellus* Sturm).

B. P. Moore.

Adlard & Son, Ltd., Dorking.

A NEW PEPPER TINGID FROM NEW BRITAIN.

By Carl J. Drake.

(*Smithsonian Institution, Washington, D.C.*).

Through the kindness of Mr. N. C. E. Miller, Commonwealth Institute of Entomology (London), I have received a series of specimens of an undescribed species of lacebug found feeding and breeding in numbers on the underside of the leaves of the black pepper plant in New Britain, Melanesia. The illustrations of the holotype were made by Mr. Arthur Smith of the British Museum (Natural History).

Nesocypselas piperica, sp. n. (Figs. 1 and 2).

Head, pronotum and narrow basal part of elytra entirely concealed dorsally by the enormously developed, inflated, turned upright, semiglobose paranota; elytra very broad, divergent posteriorly, much longer and wider than abdomen, with apices narrowed and widely separated in repose. Areolae fairly large, distinctly lacy. Pale testaceous with brownish or dark fuscous markings as described along with structures. Length, 3·50 mm.; width (behind base of elytra), 2·20 mm.

Head short, pale testaceous, nearly flat above, with two slender, short, porrect, widely separated spines between eyes; eyes small, deep black, transverse; bucculae short, fairly broad, areolate, with ends meeting in front. Labium brownish with black apex, extending between middle coxae; sulcus wide, shallow, with sides very little elevated. Antennae long, quite slender, entirely pale testaceous, all segments hairy; hairs on segments III and IV longer, extending largely at right angles, varying in length from two to three times the diameter of segment at their respective points of origin; segment I long, only a little swollen; IV feebly enlarged; measurements—I, 0·40 mm.; II, 0·10 mm.; III, 1·75 mm.; IV, 0·70 mm.

Pronotum pale stramineous, finely punctate, slightly swollen across humeri, without hood or distinct collar, unicarinate, the median carina thin, pale and a little raised; posterior projection short, triangular, obtusely angulate at apex; ostiolar canal distinct, upright. Paranota enormously developed, each semiglobose, reflexed upright, extending anteriorly scarcely beyond apex of head and posteriorly beyond apex of hind pronotal process to the abruptly widened basal part of elytra, with ends in front meeting above median carina and then slightly divergently separated posteriorly, scarcely constricted near middle above, 0·81 mm. wide (both together) above and 0·70 mm. long on each lateral side; areolae large, rather clouded with brown, the veinlets slightly more fuscous and beset with small inconspicuous hairs, each of which arises from a tiny slender base.

Body beneath with thorax testaceous and the abdomen fuscous, the latter fuscous above. Legs long, slender, pale testaceous, concolorous, shortly pubescent, the tarsi not swollen. Elytra abruptly widened near base, much wider and much longer than abdomen, 2·60 mm. long and 1·30 mm. wide at widest point, narrowed apically with apices rather sharply roundly narrowed and widely separated in repose; exterior marginal vein shortly hairy, pale testaceous, with the boundary vein separating costal and discoidal areas from sutural area depressed and, together with bordering areolae, dark fuscous so as to form a long, sinuate, oblique band; costal area very wide near base, there five or six areolae deep, narrowed to two rows behind; subcostal area sulcate, mostly biseriate; discoidal area

FIG. 1.—*Nesocypselas piperica* sp. n. Dorsal aspect.

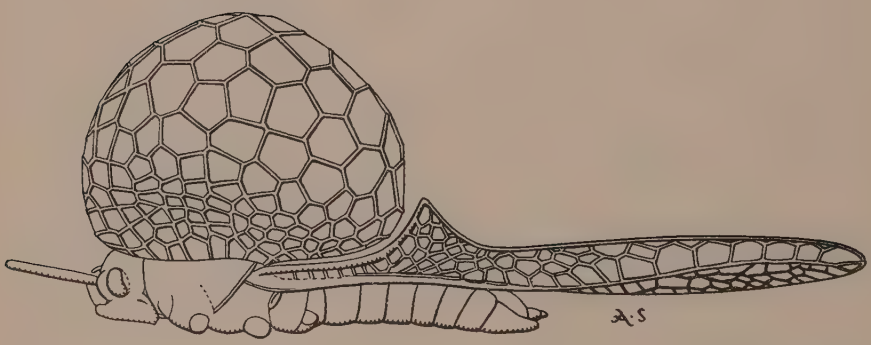

FIG. 2.—*Nesocypselas piperica* sp. n. Side view.

not sharply defined, three areolae deep, not extending to tip of abdomen, about one-fourth as long as elytra ; sutural area long, wide ; areolae moderately large to large, clear, the veins thin and testaceous. Wings vestigial, not functional in type series.

Holotype ♂ and *allotype* ♀, NEW BRITAIN : Keravat, found feeding and breeding on underside of leaves of cultivated pepper plant, 1.i.1957 (*G. S. Dun*). In the British Museum (Nat. Hist.), London. *Paratypes :* 9 specimens, same data as type. The holotype is figured.

N. piperica can be separated from *N. dicysta* Kirk. and most other members of the genus by the unicarinate paranota and the shape of the elytra. In this genus the shape and size of the paranota and of the elytra show marked dissimilarity and specific singularity in development.

THE IDENTITY OF *PAPILIO NISE* CRAMER, 1775 (LEPIDOPTERA: PIERIDAE) AND A NEOTYPE DESIGNATION FOR THIS NOMINAL SPECIES.

By Alexander B. Klots and Bernard Heineman.

In 1775 Cramer applied the name *Papilio nise* to a small yellow butterfly from Jamaica, B.W.I., which is now referred to the genus *Eurema* Hübner. In 1836 Boisduval, in the first critical attempt to characterise the species for which the Cramer name should be used, applied the name *nise* to a species, quite different in appearance from Cramer's figure, which we now know does not occur in Jamaica, although Boisduval believed that it did. From that date until the present there has been constant disagreement among authors as to the identity of the Cramer species, the matter being complicated by the fact that neither the Cramer nor the Boisduval species has been otherwise recorded from Jamaica, but that both occur widely elsewhere. Since a number of other nominal species are involved, it is extremely fortunate that the identity of the nominal species *nise* Cramer can now be established, and the controversy ended. This is possible because of the recent capture and recognition in Jamaica, apparently for the first time in some numbers, of specimens which are clearly referable to *nise*.

The Species Involved.

The two species or species-complexes involved are entirely distinct, yet closely related and sometimes, in female specimens, very similar. They can be distinguished by various characters (Klots, 1928, 1929) of which the coloration of the upper sides of the wings, especially of the males, is the most obvious and has been the most used. In the one species, which we believe to be and refer to as *nise* (Cramer) (Pl. I, figs. 1–8), the front and hind wings are concolorous, *i.e.* of essentially the same hue, which is yellow. If the wings differ in colour, it is the hind wings which are of a somewhat deeper, more orange-yellow. In the other, to which we refer as *venusta* (Boisduval) (Pl. I, figs. 9–10) the fore and hind wings of males are consistently discolorous, *i.e.* of different hues; here the front wings are always distinctly yellow, while the hind wings range from a much paler yellow to a pure white. Females of *venusta* are frequently almost concolorous, but by a paling of the front wings, never by a deepening of the hind wings.

There is little, if any, difference of opinion about the taxonomic extent of *venusta*. All modern authors regard it as a single species, ranging from Brazil northward on the mainland into Guatemala and in the Lesser Antilles to at least Guadeloupe. A single record of two specimens from Cuba is quite questionable.

There is, however, great difference of opinion about the taxonomic extent of the concolorous species or species-complex, depending upon the degrees of lumping or splitting to which various authors are prone. There is probably

general agreement that *Eurema chamberlaini* (Butler) of the Bahamas, *E. larae* (Herrich-Schäffer) of Cuba and the various populations of the *E. dina* (Poey) *leuce* (Boisduval) complex are specifically distinct. But for the rest, D'Almeida (1936) considers the populations of northern Argentina, Uruguay, Paraguay, Bolivia and most of Brazil to be one species, *tenella* (Boisduval); those of at least part of Peru to be another, *stygma* (Boisduval); and a third species, *porteri* (D'Almeida), to exist in Ecuador—all separate from the rest of the concolorous population, which he calls *neda* (Godart) but which we now know to be the true *nise*. Other authors would lump most or all of these. Such matters are outside the special province of this paper, but have been mentioned to show the confused background.

Historical Data.

The comments and bibliography which follow will suffice to show the uncertainty which has existed. Many references have been omitted from the bibliography (most of these will be found in Talbot, 1935), but it is believed that all have been included which contain important data, descriptions or expressions of opinion.

Pieris neda Latreille, 1819, certainly was applied to the concolorous species, apparently as merely a substitution for *nise*. The name can be used as that of a mainland subspecies, but otherwise is a subjective synonym of *nise*.

In 1836 Boisduval stated that, despite the fact that Cramer's figure shows a definitely concolorous butterfly, the name *nise* should be used for the discolorous species. In justification he claimed that the concolorousness of the figure was a colourist's error. Perhaps his opinion was influenced by the fact that he apparently had material of the concolorous species only from Brazil, and had a specimen of the discolorous species purported to be from Jamaica. He is neither the first nor the last author to be misled by inadequate material and inaccurate data. He therefore used the name *nise* for material of the discolorous species from Cayenne and Surinam; he applied the new name, *venusta*, to material of the discolorous species from "Jamaica" (quotation marks ours) and Colombia; and gave the new name *tenella* to material of the concolorous species from Brazil. He also placed the name *neda* (Latreille), which he attributed to Godart, partly in the synonymy of *tenella* (concolorous) and partly in that of his *nise* (discolorous). From these acts has stemmed most of the subsequent confusion.

In 1865 Prittwitz published the name *perimede* for material of the concolorous species from Corcovado, near Rio de Janeiro, Brazil. This name would fall under *tenella* (Boisduval). In 1929, through an unfortunate *lapsus calami*, it was used by Klots for the Mexican and generally northern populations of *nise* (concolorous) in a subspecific sense; and in this usage it has crept into the modern literature.

In 1869 Felder applied the name *nelphe* to Mexican material of the concolorous species. This is the oldest valid name for the northern, mainland populations of this species in a subspecific sense, and is the name which Klots intended to use in 1929 instead of *perimede*.

In 1882 Möschler objected very properly to Boisduval's 1836 action of questioning Cramer's figure and applying the name *nise* to the discolorous

species. At the same time he applied the name *diosa* to *nise* (Boisduval *nec* Cramer), the discolorous species, from Surinam. However, Boisduval's *venusta* of 1836 has priority for this species.

In 1889 Godman and Salvin stated that because of the doubt surrounding it they preferred not to use the name *nise* at all. Instead they used *tenella* (Boisduval) for the concolorous species, placing a considerable list of names in its synonymy ; and used *limbia* (Felder) of 1861 for the discolorous species for which *venusta* (Boisduval) of 1836 is actually the oldest name.

In 1909 Röber used *neda* " Godart " (actually Latreille is the proper author of this name) for the concolorous species in both text and illustration. He also gave another figure of the concolorous species under the name of *nise* Cramer, but in his text referred to the hind wings of *nise* as " extraordinarily light ", obviously thinking of the discolorous species. This did nothing to clarify the situation.

In 1929 Klots followed Möschler (and like him disagreed with Boisduval's action of 1836) in using *nise* (Cramer) for the concolorous species ; thus following the indications of Cramer's text and figure. He used *venusta* (Boisduval) of 1836 for the discolorous species.

In 1935 Marston Bates followed Klots in using *nise* (Cramer) for the concolorous species, and pointed out (quite rightly) the impropriety of Klots' use of *perimede* (Prittwitz) for the northern subspecies of this species. In 1935 Talbot also followed Klots.

In 1936 D'Almeida reverted to Boisduval's century-old concept of using *nise* (Cramer) for the discolorous species, and split the concolorous complex into *neda* (" Godart "), *tenella* (Boisduval), *stygma* (Boisduval) and *porteri* (D'Almeida).

In 1947 Dillon, and in 1948 Klots, again used *nise* (Cramer) for the concolorous species.

In 1950 Munroe used *nise* (Cramer) for the discolorous species, following Boisduval and D'Almeida, and *neda* (Latreille) for the concolorous species.

In 1951 Klots (eheu !) partly abandoned his opinion of 1928 and used *neda* (Latreille) for the concolorous species. This action, it may be said, was based on the same opinion as that of Godman and Salvin (1889), namely that such confusion by then attended the use of the name *nise* that it was best to abandon it. Unbeknown to Klots, decisive material of *nise* had recently been caught in Jamaica !

In 1953 de la Torre y Callejas and Dalmau, and in 1954 de la Torre y Callejas, used *neda* (Latreille) for the concolorous species. In both publications *venusta* (Boisduval) was used for two specimens of the discolorous species supposedly taken in Cuba in 1909.

It is obvious from the above that there has been a great lack of uniformity in the use of the name *nise* ever since Boisduval in 1836 first cast doubt upon the accuracy of Cramer's figure and questioned the occurrence of a concolorous species in Jamaica. Opinion as to Boisduval's action has been about evenly divided, with still other authors saying, in effect, " A pox on both your houses ". Let us summarise the evidence and arguments for both viewpoints.

The data and arguments (Möschler, Klots, Dillon) in favour of *nise* being the concolorous species have been :

(1) Cramer's figure (the four copies seen by the present writers agree)

plainly shows the front and hind wings concolorous, with no evidence of careless or irregular colouring.

(2) Cramer compared *nise* to *Terias hecabe* (L.), an Oriental species with the wings concolorous.

(3) Although no specimens of the concolorous species had been reported from Jamaica since Cramer, neither had there been any definite record of the discolorous species from there except for Boisduval's citation of *venusta* as occurring from " Jamaica to Colombia ". In 1926 Kaye (p. 482) gave no definite record of either, making merely a passing mention of " the reputed occurrence of *Terias venusta* " based upon the Boisduval citation.

(4) Although not a few of Cramer's locality citations are incorrect, all of the other butterflies which he named from Jamaica do indeed occur there.

On the other hand, the points in favour of *nise* being the discolorous species have been :

I. The concolorous species appeared to be absent from Jamaica.

II. The discolorous species might occur there, because of Boisduval's 1836 statement.

III (*a*) Since Cramer's figure shows no dark marginal border on the upperside of the hind wings, but merely a black dot at the tip of each vein, it must represent a female, since the males of both the concolorous and the discolorous species have dark borders.

(*b*) Occasional females of the discolorous species from Venezuela and the Guianas are almost, or entirely, concolorous, especially if somewhat worn.

(*c*) Cramer had material of the discolorous species from Surinam, where the discolorous species occurs but the concolorous one does not.

(*d*) Therefore either Cramer had a specimen of the discolorous species from Jamaica, which his colourist erroneously showed as concolorous ; or he had a concolorous variant female of the discolorous species from elsewhere than Jamaica (probably Surinam) but recorded it from Jamaica in error.

Present Conclusions.

Mr. N. D. Riley has very kindly called our attention to the presence in the British Museum of Cramer's original paintings, and has examined that of *nise* after studying the MS. and plate of this article. He confirms the fact that it illustrates the concolorous species and states (*in litt.*) : " It agrees best with figure 4 on your coloured plate. The upperside is almost exactly the same, even to the shapes of the indentations of the black fore wing border and the hind wing marginal dots. There is no difference in the colour between the fore and hind wings in the original. On the underside Cramer's figure is almost completely unmarked except for two minute black dots at or about where the cell should end (venation not very reliable in the figure)."

The new material from Jamaica, which we believe represents *nise* (Cramer) as originally described and figured, consists of 110 specimens of which 89 are males and 21 females. These have been collected over a period of nine years (1947–55) in 27 localities in seven of the 13 parishes (Portland, St. Ann, St. Thomas, St. Catherine, St. Mary, Trelawny and Westmoreland) during the months of February, March, April, June, July, August, September and December.

All are unquestionably of the concolorous species, which invalidates point I above.

No material of the discolorous species has yet appeared from Jamaica. Point II, therefore, still depends upon Boisduval's casual 1836 citation, and is at best extremely dubious.

Of the 89 males, 84, or 94·4 per cent., lack a dark border on the uppersides of the hind wings, having merely dark dots at the tips of the veins just as in Cramer's figure. This discredits point III(*a*) and makes points III (*b*) and (*c*) irrelevant. As a result, both of the conclusions of III(*d*) above sink to a level of extreme improbability.

We therefore have no hesitation in identifying *Papilio nise* Cramer (1775) as the concolorous species characterised under that name by Möschler (1882), Klots (1928, 1929, 1948), Marston Bates (1935), Talbot (1935) and Dillon (1947) as cited above.

Perhaps the most puzzling feature of the whole affair concerns the apparent failure of many collectors to catch the species between 1775 and 1947, and the certain failure of entomologists to recognise it among Jamaican material. In 1951, 1952 and 1953 the junior author examined the world's major collections of Jamaican Lepidoptera without turning up more than a half dozen Jamaican specimens that might have been *nise*. This investigation included: British Museum (Natural History), London; Rothschild Collection, Tring; University Museum, Oxford; Paris Museum; Rijksmuseum, Amsterdam; Universitetets Zoologiske Museum, Copenhagen; Canadian National Collection, Ottawa; Institute of Jamaica, Kingston; American Museum of Natural History, New York; Academy of Natural Sciences, Philadelphia; Carnegie Museum (and Avinoff Collection), Pittsburgh; and the private collections of W. J. Kaye in Guildford, England and of Peter Gunter and Robert Hart in Jamaica.

We now know that *nise* is neither local nor rare, and that in fact it can probably be taken somewhere in Jamaica during every month of the year. Yet in the past such experienced collectors and Lepidopterists as Sloane, Gosse, Watson, Avinoff, Kaye, Perkins, Shoumatoff and Bell have failed to collect, or to recognise it; and more recently C. B. Lewis, Ronald Bengry, Peter Gunter and Robert Hart have had similarly negative results.

The junior author's suggestion, based on a considerable amount of field observation and catching of the species in Jamaica, is that the chief difficulty stems from the essential similarity of *nise* to *Eurema lisa euterpe* (Menétriés). The latter (Pl. I, figs. 11–12) is an abundant and almost omnipresent butterfly which is of little interest, especially to collectors aware of the presence in Jamaica of so many more desirable species. It is, moreover, abundant at the lowest elevations and therefore would be one of the very first species of which a collector would take all he desired and which he would thenceforth ignore. On the contrary *nise* is seldom taken in the lowlands but generally flies at elevations of from 500 feet upward; and by the time the average collector has worked up to its territory he will no longer be interested in small, yellow butterfles like *lisa euterpe* but will be concentrating on such highland specialties as *Papilio homerus*, *Chlosyne pantoni* or *Eurema adamsi*.

A capture of *nise*, in 1951, illustrates this perfectly. The junior author was accompanied on a trip to Mt. Diabolo by a completely inexperienced, but highly enthusiastic young man, G. Irving Latz, who was given a net and

instructions to swing at everything. In following instructions Mr. Latz took the specimen which, recognised as something different, led to the purposeful search that has been going on ever since ! Curiously enough, this is an aberrant specimen, and the only one of its type of aberration represented in the series studied (Pl. I, fig. 7). On the undersides of both fore wings it shows a slight enlargement of the subapical dark marks, and fuscous lining along the veins toward the apex from the costal angle of the discal cell. On the undersides of both hind wings it has a heavy, but somewhat mottled, discal fuscous suffusion and fuscous lining of almost all of the veins.

We also figure (Pl. I, fig. 8) another specimen which deviates markedly from all other Jamaican ones studied. We cannot say, however, whether it represents an individual or a population variation, since we have seen no others from the same locality and season.

In the experience of both the junior author (in Jamaica) and the senior author (in Florida) *nise* does strongly resemble *lisa euterpe* on the wing, but can be distinguished when one is both aware of its potential presence and knows what to look for. It looks slightly paler, more lemon yellow ; it is slightly smaller than the average *lisa euterpe* : its flight is more active and agile, although not necessarily faster ; and it tends to keep closer to the cover of scrubby shrubs and the woods' edge, and to dodge low into cover when alarmed.

The possibility exists, of course, that *nise* has actually been extremely rare during most of the past and has only recently increased greatly in numbers. This is not, however, very probable, since one of its food plants seems to be the common *Mimosa pudica* on which the junior author has found it ovipositing. It appears to be a denizen of the scrub sere stage which occurs widely in waste places, at the edge of the forest and wherever forest has been broken into, or formerly cultivated land is going back to forest. Of this kind of environment there has always been plenty in Jamaica. The junior author has taken it ovipositing under just such conditions. It may also be admitted, chiefly for argument's sake, that the possibility exists that *nise* has never existed naturally in Jamaica or has been long extinct and only recently introduced from elsewhere. If so, it must have been introduced a good many years before 1947 to have reached its present commonness and wide distribution ; and the question would still remain why none of the recent twentieth century collectors caught or recognised it.

We conclude, therefore, that *nise* has always existed in Jamaica, probably in some numbers ; but that because of its confusion in the field with *Eurema lisa euterpe* it has been little, if at all, collected or recognised.

Geographic and Seasonal Variation.

Since our Jamaican material is almost all from the winter generation, we are unable to reach any definite conclusions regarding its geographic differentiation, if any, from other populations. The Florida material at hand consists of 36 specimens, all but seven of the summer generation, while that from mainland localities (203 specimens) ranging from Paraguay to Arizona, largely lacks dates. We hazard a guess that there is little, if any, geographic differentiation between the Jamaica and Florida populations, although there may well be between the Jamaica and some mainland populations, since the single male

and two females taken in Jamaica in July fit very well into the Florida series ; and the sole December male from Florida is in no wise different from many winter generation males from Jamaica.

Again, the dearth of summer material from Jamaica forbids definite conclusions about differences between the generations or even about the possible occurrence of a third generation. There is also very evidently a considerable difference in flight season between different Jamaica localities. It is probably a relatively safe generalisation that a winter generation flies in many localities ; and that in comparison with the summer generation the winter males are smaller, have relatively little, if any, black border on the hind wing above, and have somewhat heavier markings beneath. The summer generation appears to be much the rarer. Cramer's figure thus shows an upperside, obviously of a male, which has only black points at the ends of the veins as in the winter generation, but is almost completely unmarked beneath, as in the few summer generation specimens which we possess. We believe that it represents a summer generation male which was more lightly marked beneath than usual.

Local collectors, who have become aware of the existence of *nise* in Jamaica, are beginning to bring in occasional specimens from their trips to the uplands.

Designation of a Neotype.

Practically all authentic Cramer material in existence is in the Rijksmuseum van Natuurlijke Historie in Leiden, where at least the bulk of his collection is preserved. Some specimens are, we believe, reputed to be in the Paris Museum. In the latter there is a blank space above a label " type " under the name of *nise*. In the British Museum (Natural History) there are two males above a label (in N. D. Riley's handwriting) reading " typical *nise* Cramer described from a ♀ from Jamaica "; according to Mr. Gabriel these are very old specimens which were acquired more than 120 years ago.

In Leiden there is nothing which could be an actual Cramer specimen of *nise*. Of this we are assured by Dr. A. Diakonoff, from whose letter we quote with his permission :

" Under the label ' *nise* Cr.' in the general collection of America, in the Leiden Museum, there are only two specimens, one labelled with a round white label ' Surin ?' and another unlabelled. Both specimens are on white insect pins with globular, loose heads."

" This kind of pin is of a much later date than that of Cramer's collection. His pins are either very long and thick with peculiar, conical heads with flat tops, or a short, thick kind of an ordinary tailor's pin with a solid head. Some of Cramer's types are indeed on insect pins with globular heads, but always these specimens appear to have been reset, a big hole through the thorax showing the place of the original pin. I am quite sure, therefore, that neither of the two above-mentioned specimens can be the type of *nise*. And since no other whereabouts of Cramer's types are known besides the general collection of the Leiden Museum, we may safely accept that the type of *nise* does not exist any more."

Since, according to the above data, the type of *nise* Cramer is almost certainly lost, we consider it appropriate to select and fix a specimen as a neotype. This we hereby do. The specimen is a male caught along the road

near Millbank, Portland Parish, Jamaica, B.W.I., 3rd March, 1955, by B. Heineman (Pl. I, fig. 1). It is a very close match for Cramer's figure except for the more pointed apex of the fore wing and the deeper yellow margins of the undersides of both pairs of wings in the figure. In both these characteristics, however, Cramer's figures depart from reality in the same way, notably in *Papilio* (now *Eurema*) *phiale* which is figured on the same plate. The neotype is being deposited, along with a representative series of specimens, in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, where the Cramer collection is preserved. We consider the selection of a neotype to be a prime necessity for the exact future identification of this nominal species, upon which depend the identification and delimitation of the other nominal species that have been involved in the uncertainty.

Summary.

More than a hundred specimens taken in recent years enable the positive identification of *Papilio nise* Cramer, named in 1775 from Jamaica, B.W.I., but not positively recorded from there until now. An account is given of the confusion, which can now be cleared up, of this name and those of related species. A neotype is designated for *nise* ; and it and representative specimens of *nise* and related species are figured.

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PLATE I.

FIG. 1. *Eurema nise* (Cramer), neotype ♂, rd. near Millbank, Portland, Jamaica, B.W.I. 3.iii.1955 (*B. Heineman*).

2. *Eurema nise* (Cramer), ♀, Orangefield, St. Catherine, Jamaica, B.W.I., 10.iii.1955 (*B. Heineman*).

3. *Eurema nise* (Cramer), ♂, Corn Puss Gap, St. Thomas, Jamaica, B.W.I., 5.vii.1951 (*B. Heineman*).

4. *Eurema nise* (Cramer), ♀, Corn Puss Gap, St. Thomas, Jamaica, B.W.I., 5.vii.1951 (*B. Heineman*).

5. *Eurema nise* (Cramer), ♂, Mt. Diabolo, St. Ann, Jamaica, B.W.I., 5.iii.1951 (*B. Heineman*).

6. *Eurema nise* (Cramer), ♂, Pantrepant, Trelawney, Jamaica, B.W.I., 31.xii.1952 (*B. Heineman*).

7. *Eurema nise* (Cramer), ♀, Mt. Diabolo, St. Ann, Jamaica, B.W.I., 5.iii.1951 (*G. Irving Latz*).

8. *Eurema nise* (Cramer), ♂, Windsor, Trelawney, Jamaica, B.W.I., 19.viii.1954 (*Peter Bellinger*).

9. *Eurema venusta* (Boisduval), ♂, Canefields, Dominica, B.W.I., 18–23.xii.1933 (*L. E. Chadwick*).

10. *Eurema venusta* (Boisduval), ♀, Canefields, Dominica, B.W.I., 18–23.xii.1933 (*L. E. Chadwick*).

11. *Eurema lisa euterpe* (Menétriés), ♂, Shaw Park, St. Ann, Jamaica, B.W.I., 6.ii.1946 (*B. Heineman*).

12. *Eurema lisa euterpe* (Menétriés), ♀, Shaw Park, St. Ann, Jamaica, B.W.I., 3.iii.1947 (*B. Heineman*).

(Paintings by Miss Marjorie Statham).

Alexander B. Klots and
Bernard Heineman.

Eurema nise (Cramer) and related species.

INDEX

New names are marked with an asterisk

abdominale, Stilbops (Aphanoroptrum), *final instar larva*, 175–6
Aclonophlebia, 160
Acnephalum, 79, 83, 84
Acrotelsa, 93
Acrotelsella, 93
acuminithorax, Machilis, 89
acuminithorax, Paramachilis, 89
adamsi, Eurema, 210
aeneiventris, Melanagromyza, 184, 185, 186, 188
africana, Rhaptoneura, 13
aglaozona, Lithocolletis, 28
Agromyza, 183
AGROMYZIDAE, *spp.n. from Britain*, 162–3
albiterminata, Atalophlebia, *comparison with* A. darrunga, 65–7 ; 69
albocilia, Melanagromyza, 185
albohirtum, Dermolepida, 51, 54, 58
albohirtum, Lepidoderma, 58
*algona, Kirrara, *description*, 71
Allacrotelsa, 92
*amabilis, Tropidonotacris, 120, *description*, 121–2
amaranta, Diestogyna, 100
ambalangoda, Aspidiotus, 35
ambalangoda, Semelaspidus, 34, 35–6
ambulans, Capsus 29, 30
ambulans, Mecomma, 29
amenia, Kirrara, 71
ampla, Lymantria, 160
angelicae, Agromyza, 183
angelicae, Melanagromyza, 183, 184, 185, 186, 188
annandalei, Diplatys, 152
Anopheles, 131–9
annularis, Anopheles, 139
annulitarse, Dermolepida, 52, *redescription*, 54
annulitarse, Lepidoderma, 54
Antistathmoptera, 24–5
Aphanoroptrum, 175
APHIDIDAE, *genn. et spp.n. from Japan*, 107–12; apicalis, Haplothrips, 143–8 ; *distribution and hosts*, 143 ; *diagnosis* 143–5; *apterous, brachypterous and macropterous forms*, 145–8 ; *immature stages*, 148
*apicalis, Sisyrnodytes, 81 ; *description*, 82
apicalis, Hindsiana, 143
Apteryskenoma, 93
arboris, Phlebotomus, 167
argentipes, Phlebotomus, 165–6
*artemisiae, Melanagromyza, 184, 185, *description*, 186–7
artocarpi, Aspidiotus, 33, 34, 37
artocarpi, Partargionia, 37
artocarpi, Semelaspidus, *redescription*, 37–9
artocarpi, Targionia, 37
aruense, Rhopaea, 58
Aspidiotus, 33–5, 37
astraphaea, Dasychira, 158
atactus, Plectrothrips, 174
Atalonella, 69–70
Atalophlebia, 63–8 ; *key to nymphs*, 69
aterrimus, Sisyrnodytes, 81 ; *description*, 82–3
*atlas, Franklinothrips, *description*, 162–3
atrirostris, Grypidius, 127
var. atrirostris, Grypidius equiseti, 130
australasica, Atalophlebia, 69
var. avernense, Prosimulium hirtipes, 6, 8, 9

BAETIDAE, *spp.n. from Australia*, 72–6
*baisasi, Anopheles balabacensis, 133, 134, 135, 136, *description*, 137–8
balabacensis, Anopheles, 132, 133 ; *adult characters*, 134 ; *larval characters*, 135 ; *pupal characters*, 136 ; *sub spp.n.*, 137–8 ; 139
balabacensis, Anopheles balabacensis, 134 ; *description*, 135–7, 138, 139
balabacensis, Anopheles leucosphyrus, 131, 132, 135
*balabacensis baisasi, Anopheles, 133, 134, 135, 136, *description*, 137–8
balabacensis balabacensis, Anopheles, 134, 135, 136, 137, 138, 139
*balabacensis introlatus, Anopheles, 134, 135, 136, *description*, 137 ; 138, 139
basalis, Eumerus, *female*, 61–2
beckeri, Melanagromyza, 185
bellus, Thraulus, 43
boisduvali marsabitensis, Pseudocraea, 102
boisduvali sayonis, Pseudacraea, 102
boisduvali trimeni, Pseudacraea, 102
Braunsina, 92, 95
breve, Acnephalum, 83
brevis, Sisyrnodytes, 81, 82, 83–4, 85, 86, 88
Bruchus, 103, 106
brunneus, Ptinus, 201
brunnirostris, Grypidius, 127, 129, 130
bugandensis, Euthraulus, 43, 44, 45, 46
*Bungona, *genn. et spp.n. from Australia*, 73–5
*burgessi, Synogdoa, *description*, 156
butleri butleri, Diestogyna, 100
butleri, Diestogyna, *description of male*, 99–100, 102
butleri, Diestogyna butleri, 100
*butleri kivuensis, Diestogyna, *description*, 100, 101

CAENIDAE, *spp.n.* 76–7
Caenis, 77
caerulea, Charaxes smaragdalis, 102
calva, Peliolepisma, 98
cameruna, Lichenomima, 16
Campsomeris, 56
capensis, Cotasteridus, 19
capsulatus, Aspidiotus, 33
Capsus, 29
carinata, Tropidonotacris, 119, 120–1
carinatus, Tropidonotacris, 120
Caryedon, 103–6
Centroptilum, 75
Cercyothrips, *sp.n. from Trinidad*, 140–2
chamberlaini, Eurema, 207
Charaxes, 102
Charaxes, *two undescribed females from Uganda*, 177
Chlosyne, 210
Choroterpes, 43
cirsii, Melanagromyza, 180, 182, 184, 185, 186
cistuloides, Aspidiotus (Chrysomphalus), 33, 34, 37
cistuloides, Semelaspidus, 37
*claripennis, Eumerus, *description*, 61
clavipes, Ptinus, 200, 201
Cloeon, 72
coelebs, Diplatys, 154
*collendum, Centroptilum, *description*, 75–6
confusus, Diplatys, 154
contrarius, Dasypogon, 86, 87
contrarius, Sisyrnodytes, 81, 86
Cotasteridus, 19
Cropera, 156
croperoides, Laelia, 160
cruciatus, Globiceps, 29
*crypta, Rhaptoneura, *description*, 13–4
*CRYPTOPHARYNGINAE, *subfam.n.*, 18
*Cryptopharynx, *description*, 17–8; 19–20
Ctenolepisma, 93, 98
cunctans, Melanagromyza, 185
cunctata, Melanagromyza, 185
CURCULIONIDAE, 17–20
curtus, Acnephalum, 84
curtus, Dasypogon, 84
curtus, Euthraulus, 43, 44, 45, 46
curtus, Sisyrnodytes, 81, 82, 84–5, 87
*cyclops, Dermolepida, 52, *description*, 54–5
Cyllecoris, 29–31

daltonae, Antistathmoptera, *male*, 24–5
*darkara, Atalonella, *description*, 69–71
*darrunga, Atalophlebia, *description*, 65–7; 69
Dasychira, 157–8
Dasypogon, 84, 85
*denticulatus, Diplatys, *description*, 152–3
depuncta, Charaxes zelica, 177
Dermolepida, *revision of genus*, 51–9; *key to spp.*, 52–4
desmochrysa, Lithocolletis, 27–8
desmodiella, Lithocolletis, 28
dettmeri, Melanagromyza, 184, 185, 186
dicysta, Nesocypselas, 205
Didea, 21–3
Diestogyna, 99
dina, Eurema, 207
diosa, Eurema, 208
Diplatys, *spp.n.*, 149–54
disjunctus, Sisyrnodytes, 81, 86
dispar, Cyllecoris, *systematic position*, 29–31
dispar, Globiceps,
dispar, Mecomma, *comb. nov.* 31
disparina, Aclonophlebia, 160
divisa, Spidia, 117
divisa, Spidia fenestrata, *comb. nov.*, 117–8
*dolens, Diplatys, *description*, 153–4
dummeri, Charaxes porthos, 177
Duplaspidiotus, 33, 35, 37

Eala, 155, 156
eatoni, Rhaptoneura, 13
Echinothrips, 142
elegans, Euthraulus, 43, 44, 45, 46
*emphanipoda, Dasychira, *description*, 158
*enciarci, Notiopsylla, *description*, 192–4; 195, 196
ENTOMOBRYIDAE, *sp.n. from India*, 49–50
EPHEMEROPTERA, *spp.n. from Australia*, 63–78
equiseti, Grypidius, 127, 130
equiseti *var.* atirostris, Grypidius, 130
*erebus, Sisyrnodytes, 81, 82, *description*, 85
*estriatus, Cryptopharynx, *description*, 19–20
eucophaeatus, Sisyrnodytes, 81
eudela, Dasychira, 157, 158
Eumerus, 61–2
*eupatorii, Melanagromyza, 184, 185, 185, *description*, 187–8
Euproctis, 157
Eurema, 206–14
euterpe, Eurema lisa, 210, 211
Euthraulus, *new records and spp. from E. Africa*, 43–8; *list of species*, 44; *two unidentified spp.*, 48
excentrica, Phalacrothyris, 113
excentrica, Spidia, 113
excidens, Diplatys, 149

*fagi, Platyaphis, *description*, 110–2
falcata, Phaneroptera, 123, 125, 126
fasciata, Didea, *comparison with* fuscipes, 21–3
fasciatus, Nosopsyllus, 190, 195
fenestrata divisa, Spidia, *comb. nov.*, 117–8
fenestrata fenestrata, Spidia, 114–6
*fenestrata goniata, Spidia, *description*, 118
fenestrata, Spidia, 113
fenestrata, Spidia fenestrata, 114–6
fenestrata *var.* fenestriculata, Spidia, 114
fenestriculata, Spidia, 114
var. fenestriculata, Spidia fenestrata, 114
var. *flavipleura, Xanthogramma pedissequum, 62
flavomaculatus, Globiceps, 29–31
fletcheri, Diplatys, 154
floccus, Sisyrnodytes, 81, 86, 87
foetens, Megaponera, 94
Franklinothrips, 172–3
*funambuli, Namunkulina, *description*, 95–7

fur, Ptinus, 199–201
fuscipes, Didea, *comparison with* fasciata, 21–3
fuscociliata, Melanagromyza, 184
fuscus, Bruchus, 103
fuscus, Caryedon, *taxonomic position*, 103–6 ; *genital armature*, 103–4

*galbinus, Cercyothrips, *description*, 140–1, 142
galli, Prosimulium, 5
ganymedes, Rhypopteryx, 160
glaber, Lepidoderma, 57
gladiator, Diplatys, 152
Globiceps, 29–31
Glyphotriclis, 79
gonager, Caryedon, *taxonomic position*, 103–6
gonager, Pachymerus, 103
gonagra, Bruchus, 103
goniaea, Melanagromyza, 183, 185
*goniata, Spidia fenestrata, *description*, 118
Goniopsyllus, 192
*gracillimus, Diplatys, *description*, 150
gracilis, Phaneroptera, 125, 126
*grandis, Tropidonotacris, 120, *description*, 122
Graphitarsus, 89
greeni, Diplatys, 150, 152, 154
grotei, Dasychira, 158
Grypidiopsis, 127
Grypidius, 127–30 ; *key to spp.*, 129–30
Grypus, 127

Haplothrips, 143–8
*hardenbergiella, Lithocolletis, *description*, 26 ; *comparison with allied spp.*, 27–8
heardi, Parapsyllus magellanicus, 189–90, 191, 195
hecabe, Terias, 209
Hemictenarcha, 113
*heracleivora, Ophiomyia, *description*, 162–3
Hindsiana, 143
hirtellus, Ptinus, 199, 200, 201
hirtipes, Prosimulium, 1, 2, 3, *comparison with allied holarctic forms*, 4–10
hirtipes *var.* avernense, 6, 8, 9
homerus, Papilio, 210
horni, Isolepisma, 94
hova, Diplatys, 149
Hyperlepisma, 93
hypnota, Dasychira, 157
*hypnotoides, Dasychira, *description*, 157

Idiogramma, 175
incerta, Atalophlebia, 67, 69
var. indicus, Phlebotomus squamipleuris, 168–9
*inflatum, Prosimulium, *description*, 1–4 ; 5, 9
insularis, Diplatys, 149
intermedia, Lichenomima, 16
*introlatus, Anopheles balabacensis, 134, 135, 136 ; *description*, 137 ; 138, 139
*ionthada, Euproctis, *description*, 156–7
Isolepisma, 92

*ituriensis, Diestogyna, 99 ; *description*, 100–1
iyengari *var.* malayensis, Phlebotomus, 168

*jacksoni, Olapa, *description*, 155
javanicus, Graphitarsus, 91
*jillongi, Tasmanocoenis, *description*, 76–7

kerguelensis, Goniopsyllus, 192
kerguelensis, Notiopsylla, 189, 190–2, 193, 194, 195
kerguelensis, Pulex, 192, 194
Kirrara, 71
*kivuensis, Diestogyna butleri, *description*, 100, 101

Laelia, 160
*lampreyi, Pseudentomobrya, *description*, 49–50
langsbergei, Lepidoderma, 58
languidus, Bruchus, 103
languidus, Caryeborus, 103
languidus, Caryedon, *taxonomic position*, 103–106
languidus, Pachymerus, 103
Laphystiini, 79
lappae, Melanagromyza, 183, 184, 185, 186, 188
larae, Eurema, 207
*lasia, Eala, *description*, 155–156
latro, Ptinus, *identity and taxonomic status*, 199–201
*leechi, Grypidius, *description*, 128–129, 130
leleupi, Lepisma, 94
Lepidioderma, 51
Lepidoderma, 51
Lepisma, 92
LEPISMATIDAE, *gen. et spp.n.* 91–98
LEPISMATINAE, *key to genera*, 92–93
Lepismina, 92
Lepismodes, 93
leptomita, Olapa, 155
LEPTOPHLEBIIDAE, *spp. n. from Australia*, 63–68
leuce, Eurema, 207
Leucolepisma, 93
leucosphyrus, Anopheles leucosphyrus, 131–133
leucosphyrus, Anopheles, *taxonomic position of species group*, 131–133 ; *diagnosis*, 133 ; *adult characters*, 134 ; *larval characters*, 135 ; *pupal characters*, 136 ; 137, 138–139.
leucosphyrus balabacensis, Anopheles, 131, 132, 135
leucosphyrus leucosphyrus, Anopheles, 131–133
likilembae, Dasychira, 157
limbia, Eurema, 208
Limothrips, 142
lisa euterpe, Eurema, 210, 211
Lithocolletis, *sp.n. from New Zealand*, 26–28
lixi, Dermolepida, 53, 57
*lobatus, Plectrothrips, *description*, 173–174
longicaudata, Atalophlebia, 69

longicornis, Diplatys, 149
longicornis longicornis, Parapsyllus, 189, 195
longicornis, Parapsyllus longicornis, 189, 195
luscinius, Dasypogon, 85
luscinius, Sisyrnodytes, 81, 85–86
luteola, Myolepta, 60
Lymantria, 160
LYMANTRIIDAE, *spp. n. from Africa*, 155–161

MACHILIDAE, *spp.n.*, 89–91
Machilis, 89
*macnulyti, Dasychira, *description*, 157–158
maculosa, Atalophlebia, 69
magellanicus heardi, Parapsyllus, 189–190, 191, 195
*magnifica, Rhaptoneura, *description*, 11–13
maindronii, Graphitarsus, 91
major, Sisyrnodytes, 81, 82, 83 ; 86
*malayae, Phlebotomus zeylanicus, *description*, 166–167
*malayanus, Diplatys, *description*, 150–152
var. malayensis, Phlebotomus iyengari, 168
mangiferae, Semelaspidus, 33, 34, 37 ; 39–40
mannerheimi, Grypidius, 127, 129, 130
marginatus, Euthraulus, *comb. nov.*, 44
marginatus, Thraulus, 43
marsabitensis, Pseudacraea boisduvali, 102
maura, Ophiomyia, 162
*maxima, Lichenomina, *description*, 14–16
Mecomma, 29–31
*meeki, Dermolepida, 53, *description*, 58
megalops, Franklinothrips, 163
Megaponera, 94
Melanagromyza, *British, spp.n.*, 179–83 ; *additions to list*, 183 ; *food plants*, 184 ; *key*, 184–6 ; *German spp.n.*, 186–8
Melanaspis, 35, 39
melandryi, Ophiomyia, 162, 163
mimetica, Mecomma, 29
minimus, Anopheles, 139
Mirolepisma, 93
mixtus, Diplatys, 150
mobilis, Ptinus, 201
Monachina, 93, 95
montana, Sinella, 49
Mormisma, 92
*mucronatus, Diplatys, *description*, 149
muscosa, Dasychira, 157
Mycetaspis, 35
Myolepta, 60–61
MYOPSOCIDAE, *spp.n. from Natal*, 11–16

nakanoensis, Phaneroptera, 123
*Namunukulina, 93, *description*, 94–95
*nandirum, Cloeon, *description*, 72–73
nanus, Diplatys, 150
*narilla, Bungona, *description*, 73–75
neda, Eurema, 207, 208
neda, Pieris, 207, 208
nelphe, Eurema, 207
Neomorgania, 33
Nesocypselas, 203–5
*nibletti, Melanogromyza, *description*, 180 ; 184, 185, 186
niger, Sisyrnodytes, 81, 82, 86
nigra, Lepidoderma, 57
nigriceps, Diplatys, 152
*nigritarsis, Myolepta, *description*, 60–61
nigro-antennata, Phaneroptera, 123, 124, 125, 126
nigrum, Dermolepida, 53, 57
nilgiriensis, Diplatys, 154
nilicola, Acnephalum, 86
nilicola, Sisyrnodytes, 81, 82, 86–87
nise, Papilio, 206–214 ; *species complex*, 206–7 ; *historical data and conclusions*, 207–11 ; *variation*, 211–2 ; *designation of neotype*, 212–3
nitens, Sciapus, 197
niveipilosus, Sisyrnodytes, 81, 82, 87
Nosopsyllus, 190, 195
nostradamus, Melanagromyza, 185
Notiopsylla, 190–4
Notohyba, 157
Notolepisma, 94
*noxium, Dermolepida, 53, *description*, 56

Olapa, 155
*oldroydi, Sciapus, 197–8
olsufiewi, Diplatys, 150
Ophiomyia, 162–3
orientalis, Charaxes smaragdalis, 102
orientalis, Mecomma, 29

Pachymerus, 103
pallidus, Anopheles, 139
Panlepisma, 93
pantoni, Chlosyne, 210
Papilio, 206–14
papuana, Lepidoderma, 55
papuanum, Dermolepida, 52, 54, 55
Paramachilis, 89
Parapsyllus, 189, 191
Paraonidia, 33
Parrottia, 33
Partargionia, 33, 34
parvulus, Euthraulus, *comb. nov.*, 44
parvulus, Thraululus, 43
pauliani, Lichenomima, 16
pedissequum *var.* flavipleura, Xanthogramma, 62
pedissequum, Xanthogramma, 62
Peliolepisma, 93
perfragilis, Alpenus, 160
*perfragilis, Rhypopteryx, *description*, 160
perimede, Eurema, 207, 208
phaedropodaa, Dasychira, 158
phaeospila, Olapa, 155
Phalacrothyris, 113
Phaneroptera, *sp.n. from Formosa*, 123–6 ; *key to spp.*, 126
phiale, Eurema, 213
phiale, Papilio, 213
*phillipsi, Graphitarsus, *description*, 89–91
PHLEBOTOMINAE, *spp.n. from Malaya*, 165–71
Phlebotomus, 165–71
*phoenicopoda, Rhypopteryx, *description*, 159–60
pica, Dermolepida, 53, 57, 58
pierda, Atalophlebia, 68, 69

Pieris, 207, 208
*piperica, Nesocypselas, *description*, 203, 205
*Platyaphis, *description*, 109–10; *sp.n.*, 110–2
Plectrothrips, 173–4
poelicanthes, Rhypopteryx, 159
porteri, Eurema, 207, 208
porthos dummeri, Charaxes, 177
potens, Myolepta, 60
preissi, Rhypopteryx, 159
Prolepismina, 92, 95
Prosimulium, 1–10
Pseudacraea, 102
Pseudaonidia, 33
Pseudentomobrya, 49–50
Pseudocloeon, *comparison with* Bungona, 73
Pseudotargionia, 33
Ptinus, 199–202
pubescens, Melanagromyza, 183, 185
pulchellus, Eumerus, 61
Pulex, 192, 194
pulicaria, Melanagromyza, 185

ramsayi, Anopheles, 139
*reidi, Phlebotomus, *description*, 169
rhizophorum, Prosimulium, 1
Rhypopteryx, 158–60
ribensis, Diestogyna, 99, 100, 101
ridleyi, Diplatys, 152
rubrisecta, Hemictenarcha, 113
rufipes, Prosimulium, 5, 6, 8, 9
rufus, Sisyrnodytes, 81, 86, 87
rugicollis, Grypidius, 127, 129

saccharina, Lepisma, 94
saltus, Prosimulium, 1
salvazae, Diplatys, 152
Sandflies, spp.n. from Malaya, 165–71
*sativae, Melanagromyza, *description*, 180–2; 184, 185, 186
sayonis, Pseudacraea, boisduvali, 102
schineri, Melanagromyza, 185
*schmidi, Graphitarsus, *description*, 91
Sciapus, 197–8
Semelaspidus, *literature* 33; *historical review*, 33–34; *distribution*, 34; *definition*, 34–35; *description of spp.*, 35–42.
sericaria, Euproctis, 157
Sericothrips, 142
serratus, Bruchus, 103, 106
silvaticus, Phlebotomus, 167
Silvestrella, 92, 95
simplex, Melanagromyza, 185, 186
simplex, Synogdoa, 156
simplicoides, Melanagromyza, 185
Sinella, 49
SIPHONAPTERA, *from Amsterdam Is.*, 189; *Kerguelen Is.*, 189–92; *Antipodes Is.*, 192–4; *hosts*, 195
Sisyrnodytes, 79–88, *description of genus*, 79–81; *key to spp.*, 81–82; *descriptions of included spp.*, 82–88
Sitones, 127
smaragdalis caerulea, Charaxes, 102
smaragdalis orientalis, Charaxes, 102
*sorini, Tsugaphis, *description*, 107–9
sphegiformis, Globiceps, 29–31
Spidia, *notes on and description of ssp.n. from Mt. Ruwenzori*, 113–8
squamipleuris *var.* indicus, Phlebotomus, 168–9
stantoni, Phlebotomus, 166
Stilbops, *systematic position as indicated by larval characters*, 175–176
striatus, Cercyothrips, 142
strigatus, Eumerus, 61
Stringaspidiotus, 33
stygma, Eurema, 207, 208
subalpinus, Globiceps, 29
*subater, Sisyrnodytes, 81, 82; *description*, 87–88
sublobatus, Diplatys, 151
superba, Atalophlebia, 69
sylvestris, Phlebotomus, 167
Synogdoa, 156
*syntomoides, Rhypopteryx, 155, *description*, 159
SYRPHIDAE, *spp.n. from Yugoslavia*, 60–62

Tasmanocoenis, 76–77
tenella, Eurema, 207, 208
Terias, 209
testacea, Cropera, 156
testaceus, Ptinus, 199, 201
Thecesternus, 18
*theobromae, Semelapsidus, *description*, 40
Thermobia, 93
Thraululus, *syn. of* Euthraulus, 43; 44, 48
Thraulus, 43
THYSANOPTERA, *spp.n. from Belgian Congo*, 172–4
tibialis, Sitones, 127
tillyardi, Tasmanocoenis, *comparison with* jillongi, 76–77
*torilidis, Melanagromyza, *description*, 182; 184, 185, 186
*traubi, Phlebotomus, *description*, 169–70
travisi, Prosimulium, 1
trifurcata, Choroterpes, 43
trifurcatus, Euthraulus, *comb. nov.*, 44
triglandulosa, Semelaspidus, 37
triglandulosus, Aspidiotus, 33, 34, 37
*trigonia, Phanoptera, *description*, 124–125; 126
trimeni, Pseudacraea boisduvali, 102
*tripolii, Melanagromyza, *description*, 182–3; 184, 185, 186
*tropicalis, Euthraulus, *description*, 44–45; 46, 48
Tropidonotacris, *generic revision*, 119–122; *diagnosis*, 119; *key to spp.*, 120; *descriptions of spp.*, 120–2
*Tsugaphis, *description*, 107; *spp.n.*, 107–9
*tylota, Rhypopteryx, *description*, 158–9

undata, Lepidoderma, 55
undatum, Dermolepida, 53, 55–56
uniforme, Dermolepida, 52, 55
uniforme, Lepidoderma, 55
uniformis, Rhopaea, 55
ursinum, Prosimulium, 1
*usambarae, Euthraulus, 44, 45, *description*, 46–47; 48

venusta, Eurema, 206, 207, 208, 209
*verbasci, Melanagromyza, 184, 185, 186, *description*, 188
viator, Diplatys, 149
vittatus, Grypidius, 127
*vitis, Cryptopharynx, *description*, 18–19

waterhousei, Lepidoderma, 58
*whartoni, Phlebotomus, *description*, 167

Xanthogramma, 62

*yugana, Atalophlebia, *description*, 63–65; 69

zelica depuncta, Charaxes, 177
*zeylanicus malayae, Phlebotomus, *description*, 166–167